COMBAT AIRCRAFT 127

Peter E Davies

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SERIES EDITOR TONY HOLMES

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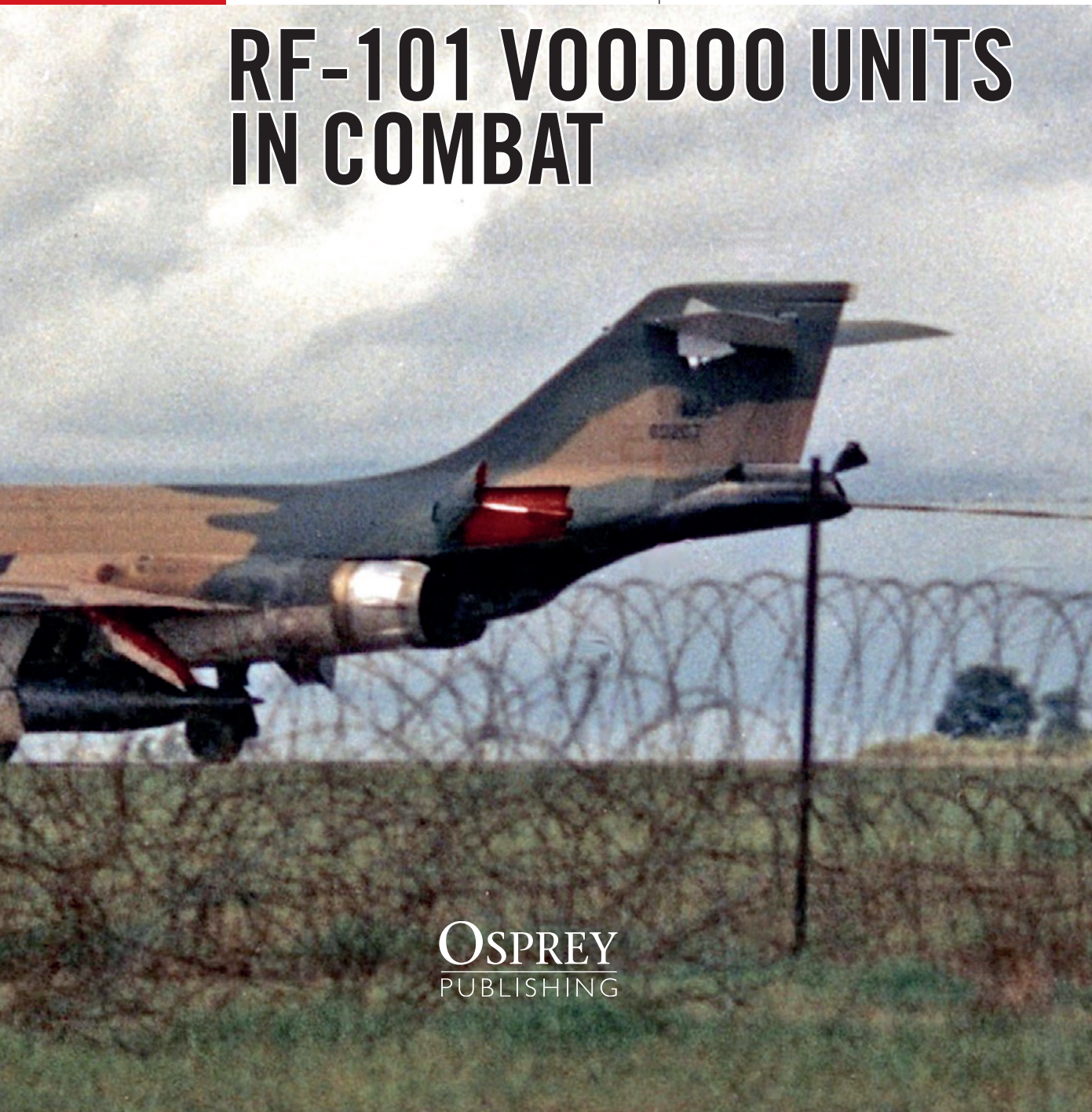

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The first F-101A Voodoo (53-2418) baking in the midday sun on Muroc Dry Lake, California, in September 1954, just before its first flight. The aircraft had been dismantled at St Louis and transported to Edwards AFB in two C-124 transport aircraft. On its maiden flight a T-33 camera aeroplane was lined up to take off with the Voodoo and film its first flight, but test pilot Bob Little explained that he told its pilot 'things were going to move pretty fast'. The cameraman doubted that, but soon found that his only film of the take-off was 'a rear view of a cloud of dust' from the desert airstrip (*Author's Collection*)

CHAPTER ONE

VOODOO BLOODLINES

Like most US aircraft firms, James S McDonnell's small company (J S McDonnell & Associates) suffered badly during the Great Depression after some unsuccessful initial designs. Reformed in St Louis, Missouri, in 1939 as the McDonnell Aircraft Corporation, the firm's first product was a twin-engined high-altitude interceptor intended for the US Army Air Corps. Two prototypes of the XP-67 Moonbat were built following experimentation with blended wing concepts that incorporated fuselage, engines and wings into one smoothly contoured shape. The first XP-67 (42-11677) was lost after an engine fire in September 1944 and the proposal was not pursued further.

McDonnell turned to the US Navy, applying the blended wing idea in 1945 to a twin jet design, the FH-1 Phantom, which became the first carrier-capable jet fighter although only 60 were manufactured. It led in 1947 to the similar but more powerful F2H Banshee, which fought successfully in Korea, continued in Canadian service until 1970 and generated orders for 895 aircraft, including radar-equipped nightfighter and photo-reconnaissance versions.

The company also pursued USAF orders. Designers Edward 'Bud' Flesh and Kendall Perkins commenced work on the very advanced Model 36 or XP-88 (XF-88 after July 1948) long-range 'penetration fighter' from April 1946, 15 months after the FH-1 Phantom's first flight. The USAF wanted it to reach 600 mph, be capable of attaining a ceiling of 40,000 ft

and boast a 900-mile combat radius. Based on World War 2 experience, it was assumed that escort fighters would be required for the post-war fleet of huge, slow-moving Convair B-36 bombers on their 10,000-mile sorties. The loss of 34 Boeing B-29s in the Korean War, many to MiG-15 jets, seemed to reinforce this belief.

Unlike McDonnell's naval fighters, the XF-88 had a swept wing and all-moving tailplane, the latter being mounted higher on the vertical stabiliser than the Banshee's, although a Vee ('butterfly') tail was also considered. The designers chose a 35-degree wing sweep, which had proved to be successful in the F-86 Sabre at a time when swept wings were still a risky innovation. Captured German research revealed that a 35-degree sweep had been favoured during their tests of wings for jet aircraft. McDonnell also aimed for minimum wing thickness (although this ruled out range-extending, but wing-twisting, wingtip fuel tanks) and incorporated innovative, irreversible powered flying controls.

Twin Westinghouse J34 engines exhausted under the tapered upward-inclined rear fuselage, on which forward-opening, perforated airbrakes were mounted. The engines – later boosted with McDonnell-designed short afterburners to 3600 lbs thrust each in the XF-88A – were fed by wing-root air intakes. Their size, and the need for access during servicing, meant that they could not be built into the wing root as they had been on the FH-1 and F2H, where their location increased the space for fuel in the fuselage. McDonnell became the first aircraft firm to design an innovative afterburner for its own jets after several engine manufacturers declined to provide one. It included the first multi-element jet nozzle for a turbojet engine and increased the aircraft's maximum speed to 708 mph. The single-seat cockpit provided good visibility through a bubble canopy.

In keeping with James McDonnell's reputed love of the occult, it followed the 'Banshee' and 'Phantom' tradition in being named 'Voodoo'. Many of these design features appeared in evolved form in the company's F-101 Voodoo ten years later.

The prototype XF-88 (46-525) made it first flight on 20 October 1948, with McDonnell Chief Test Pilot Robert Edholm subsequently reporting that it handled well despite weight increases above its 15,000-lb design gross limit. However, the XF-88's rate of climb and range with the non-afterburning J34 engines was particularly disappointing. McDonnell anticipated, however, that the improved afterburning-equipped Westinghouse J46-WE-2 engines would be capable of achieving 6000 lbs of thrust apiece, and they would power considerable numbers of improved production examples for the USAF. With afterburning J34s, the XF-88A climbed faster and reached Mach 1.18 in a steep dive on its 70th flight on 12 May 1949 at a time when supersonic flight was still a rarity.

The first XP-88 (later XF-88-MC) just after roll-out at McDonnell's St Louis factory in August 1948. The wingspan, which remained the same for the F-101 Voodoo at 39 ft 8 in., appeared to be much smaller proportionally when the fuselage length was increased from 54 ft (for the XF-88) to 69 ft 3 in. for the RF-101. The afterburners, shortened to avoid ground contact on rotation, were not flight-tested until June 1949 (*Author's Collection*)

McDonnell was quick to publicise the enhanced performance of the XF-88A as part of its sales campaign to secure an order from the USAF. The latter, however, was committed to buying the faster North American F-86 Sabre and Republic F-84 Thunderjet – subsequently used by Strategic Air Command (SAC) as a penetration fighter – from 1949, as well as the Lockheed F-80 Shooting Star, its first jet fighter, which had entered service in 1944. Although the XF-88 was promising, there were no funds or future for the unattainable mission it was designed for.

Rival manufacturer Lockheed submitted the XF-90 as its penetration fighter, and like the XF-88A it too was a twin-jet single-seater with a 35-degree swept wing. As with the McDonnell interceptor, the XF-90 featured six 20 mm M24 or M39 cannon in its nose. It was clear from the outset that neither aircraft would be capable of accompanying bombers over a useful distance, even when the fighters were fitted with wingtip fuel tanks. Like many other contemporary designs, both the XF-88A and XF-90 were hamstrung by the slow development of jet engines compared with rapid advances in aerodynamics. Poor thrust-to-weight ratio, sluggish acceleration and high fuel consumption led to overweight airframes in which fuel was crammed into every available space. Indeed, the XF-90 relied on jettisonable jet-assisted take-off rockets to successfully take off from most runways. These proposed penetration fighters would have been unable to meet the USAF's range and altitude requirements and incapable of fighting off enemy interceptors as they approached the target area.

A belated fly-off was held at Edwards AFB, California, between the XF-88, the XF-90 and North American's YF-93A (a late entry that was basically an F-86 Sabre with extra fuel capacity) from 29 June to 7 July 1950. A team of highly experienced USAF pilots that included Capt Chuck Yeager and Lt Col 'Pete' Everest exercised the three fighters over the desert. Only the first XF-88A was available since Everest had had to make a belly landing in 46-526 after engine failure on 16 June. Although the USAF's Air Material Command (AMC) stated that the XF-88A was 'ranked number one of the three', it was also made clear that 'No procurement of any of the three types is contemplated at this time.' Several test pilots, including F-86 combat veteran Maj 'Gus' Julian, considered it equal to the F-86 as an interceptor.

The worsening situation in the Korean War had already given the USAF other priorities, however, and new-production F-86s were readily available together with other established fighter and bomber types. These were duly ordered in large numbers at the expense of new initiatives. By 1958 both XF-88As had been dumped for scrapping at Langley AFB, Virginia.

Aware of Gen Curtis LeMay's ongoing desire, as commander of SAC, to protect his bombers from future, improved Soviet interceptors, McDonnell sought ways to extend the XF-88A's range in order to make the aircraft better suited to the escort mission. Extra fuel was planned for internal wing tanks. A lengthened fuselage and more powerful Allison J71 engines were slated for the upgraded Model 36R. Alterations to the undercarriage position and engine compartments combined with an even thinner, wider wing were included in an ongoing development programme that took the XF-88 increasingly close to its J57-powered Model 36W version, which in turn began to resemble the definitive F-101 Voodoo.

As part of a NACA programme, the first XF-88A (46-0525) was rebuilt with an additional Allison XT38-A-5 turboprop driving a short-bladed, three-speed propeller in its nose as the XF-88B – on 27 June 1953 it became the world's first official supersonic turboprop aircraft. Turboprops appeared to offer better fuel economy on long-distance missions, although installing the extra engine reduced the fuel tankage. A turboprop version of Republic's F-84 was built as the XF-84H, but its excessive noise and vibration induced severe nausea in anyone that stood close to it.

Strike fighter, two-seat all-weather fighter and even carrier-based XF-88 derivatives were also briefly suggested, and the XF-88A performed tests with bombs, rockets and cannon. Perhaps most interesting was the RF-88A proposal with interchangeable noses for field modification as a 'swing role' fighter or photo-reconnaissance platform. A similar multi-role concept was initially proposed for the company's F4H Phantom II, but the aircraft to most immediately benefit from this study was the XF-88A-inspired YRF-101A Voodoo.

VOODOO TWO

The USAF had clearly been impressed by the XF-88's potential, and it remained convinced that escort fighters were a viable project for SAC's immediate future, particularly as the Korean War had revealed the unexpected threat posed to its B-29 bombers by MiG-15s. However, SAC policy was also moving away from World War 2-style heavy bomber formations to solo attacks by jet-powered Boeing B-47 Stratojets, which were due to enter service in 1951 as replacements for the B-36. Also, Gen LeMay had lost interest in the escort fighter idea. B-47s would operate on solo missions at high speed rather than in escorted formations. The Stratojet's chief adversary would be the SA-1 'Guild' surface-to-air missile (SAM), rather than an interceptor, and the follow-on Boeing B-52 Stratofortress boasted a sufficient top speed and cruising altitude to put it beyond the reach of contemporary fighters.

McDonnell was encouraged to continue with the evolution of its long-range strategic fighter concept, but to modify the design so that it could also perform the tactical strike mission through the delivery of small nuclear weapons against targets such as enemy air defences on B-47 approach routes. The aircraft's ability to perform this new and demanding

F-101A-5-MC 53-2426, with patches of high-visibility orange and light-grey paint, was christened *FIRE WALL* for its absolute world speed record attempt on 12 December 1957 when it reached 1207.6 mph at 39,000 ft. Longer F-101B-type afterburners were installed in engines that were tweaked to give an extra 12 per cent thrust for that flight, undertaken by Maj Adrian Drew, which brought the Voodoo's unprecedented performance to public attention. It was the first production aircraft to exceed 1000 mph, and test pilot Harry Schmidt unofficially took it to within touching distance of Mach 2. The RF-101C's future as the USAF's fastest tactical reconnaissance jet was assured (*USAF*)

task was aided by the advent of a new generation of far more powerful, reliable and economical turbojet engines. The two-spool Pratt & Whitney J57 arrived in 1952, offering up to 15,000 lbs of afterburning thrust compared with 3600 lbs for the XF-88's J34. Given a much larger fuselage to contain fuel for a pair of J57s, the new McDonnell fighter had twice the combat radius of the original Voodoo at a much higher maximum speed. In combat, the twin engine configuration would prove to be a life-saver for several RF-101C pilots after ground fire damaged one J57. The internal fuel load of 2340 gallons was five times that of an F-84 Thunderjet.

These factors were the basis of AMC's Weapon System 105 (WS-105A) requirement for what was then called a 'strategic fighter'. It specified a maximum range of 8000 miles – less than the B-36's 10,000-mile range, but sufficient, nevertheless, to escort the massive bomber on many of its missions. The common view among SAC crews at the time was that their mission would be a one-way effort anyway, so escorts for the homeward journey would be unnecessary.

'Bud' Flesh and his team duly returned to the XF-88 design, adding the bigger J57 engines and fuel that occupied most of the fuselage aft of the cockpit. They soon realised that the much-enlarged airframe would become a substantially new aircraft. After receipt of a USAF Letter of Intent in January 1952, the revised design received the designation XF-101.

Larger air intakes with variable ramps and boundary layer bleed, slightly increased wing area through a chord-wise extension to the inboard section and repositioning of the horizontal stabiliser nearer the top of the much broader tail fin (twice the size of the XF-88's) were obvious external differences. The tail configuration was decided quite late in the process by wind tunnel tests as the best compromise for both low and supersonic speeds with optimum control authority without enlarging the stabiliser's area significantly, but it was to become the Voodoo's Achilles' heel. Fuselage length increased from 54 ft 2 in. to 67 ft 5 in. (and would be further elongated to 69 ft 4 in. for the reconnaissance RF-101A/C versions), while the wingspan remained the same as the XF-88A's at 39 ft 8 in.

Gross weight, at around 48,000 lbs for early F-101 versions, was more than twice the XF-88A's and it made the F-101A the heaviest single-seat fighter to have been built at that time, with the highest wing loading and thrust-to-weight ratio. This weight required considerable strengthening of the wing structure, with thick, machined skins. Its extended inner wing section allowed for very large landing flaps. The introduction of British-designed in-flight refuelling enabled further range extension, so a retracting probe was installed in the forward fuselage, which would also contain an AN/APG-37 radar.

Only four of the XF-88's 20 mm cannon were included, with an MA-7 fire-control system, although provision was made for unguided folding-fin aerial rockets, Hughes AIM-4 Falcon guided missiles and a large Mk 5 nuclear weapon on a centreline pylon, guided by an MA-2 low-altitude bombing system and delivered in a new Vertical Angle Delivery mode – a more survivable 'toss-bombing' tactic. The F-101A nose, dummy refuelling probe and one-piece 'slab' stabilator were flight-tested in the second XF-88A in 1952.

McDonnell's efforts were rewarded in May 1953 with its first USAF production contract in the form of an order for 29 F-101A development aircraft. Since the jet was regarded as a development of the XF-88, no 'XF-101' prototype was included. A year later, the company received a contract for two RF-101s – the first stage of a process under the WS-105L requirement to replace the Republic RF-84F Thunderflash, which was then the USAF's main tactical reconnaissance vehicle. At a time when the company was experiencing severe powerplant-related difficulties with its F3H Demon naval fighter, the USAF contracts were particularly welcome.

The first F-101A, 53-2418, was rolled out at St Louis on 11 August 1954 with the letters 'USAF' proudly displayed above its right wing. Airlifted to Edwards AFB on 20 August 1954, the aircraft was flown from here for the first time by company Chief Test Pilot Bob Little on 29 September. He outran his F-100 Super Sabre chase aeroplane and reached Mach 1.07 – the first time that an aircraft had gone supersonic on its maiden flight. There was some brief, repeated engine compressor stalling, which became more severe on the second flight during a steep turn. Urgent modifications to the air inlets were required as the lack of a supersonic wind tunnel had made data and predictions about intake airflow somewhat imprecise.

A more serious problem was revealed as soon as engine modifications to reduce compressor surge and afterburner relight issues, together with longer Type II inlets with extended splitter plates (tested on F-101A 53-2419 and introduced on the 12th aircraft), allowed the aircraft to perform manoeuvring that involved higher angles of attack (AoA). Airflow across the wing then disturbed the air passing over the high horizontal tail. Lift and pitch control were lost and the nose would rise up, leading to a spin that could prove to be unrecoverable. McDonnell's later F-4 Phantom II would also experience control loss and pitch-up if ailerons were used at high AoA rather than the rudder – a potentially lethal phenomenon that was sometimes known as the 'Phantom Thing'. In Britain, the Gloster Javelin, with a delta wing and high T-tail, had similar difficulties, and upon service entry in 1956 manoeuvring in the vertical plane was forbidden.

The F-101A's pitch-up phenomenon occurred when Little was testing for engine stalls in a turn at Mach 1.2. It was more likely to occur at higher altitudes where a loaded aircraft with drop tanks was already sustaining lift at an AoA that was close to the pitch-up or stick reversal stall point. It could also occur on 'short finals' to landing when pilots adopted a high AoA to take advantage of the aircraft's considerable aerodynamic braking effect. If the aircraft pitched-up steeply, terminal compressor stalls would result and flames could stream from the air intakes.

McDonnell began an urgent programme to establish methods of coping with this deficiency. It became clear that the relatively small, swept wing was particularly susceptible to the pitch-up phenomenon following the forward movement of the aircraft's centre of lift when AoA increased, pushing the nose up, increasing down-forces on the tail and destroying lift. Also, as AoA increased, wingtip vortices moved gradually inboard along a swept wing until they created a combined vortex over the inner wing that added to the disturbance over the tailplane and negated its effect as a pitch control. None of this was clearly realised until intensive wind-tunnel tests were conducted at NACA Langley.

Alternative tail configurations and ventral fins were considered as partial solutions, but further tests in the NACA Ames wind tunnels showed that the similarly long-bodied, high-tailed Lockheed F-104 Starfighter shared the same basic pitch-up tendency that would have required a total redesign to cure.

The USAF's trials were scheduled to begin in November 1954, managed by Brig Gen J Stanley Holtner, commander of the Air Force Flight Test Center. SAC's view of the F-101 had by then already changed after it realised that the bomber escort task was impractical. The command had cancelled its order on the same day as Little's first flight. In 1955 SAC also transferred the RF-101 project to Tactical Air Command (TAC), which could certainly use it, and also saw the F-101A as a valuable asset in its new tactical nuclear strike force. The latter had been developed as a means of offering a wider range of defensive responses other than an all-out SAC bomber or missile assault.

USAF planners also began to consider the aircraft as a long-range interceptor for the WS-217A requirement issued by Air Defense Command (ADC) for which the F-104 had proven unsuitable. This led to the development of the F-101B two-seat, missile-armed interceptor. A straight-line flightpath to an interception might not incur the risks that seemed to be inherent when manoeuvring an F-101.

As USAF pilots began to fly the aircraft in Phase III of the trials, the pitch-up problem continued through 1955-56 and began to threaten the F-101's entire future. Capt John Dolan was killed when his aircraft (53-2437) crashed in a flat spin at Edwards after encountering severe pitch-up during his first check-flight at 35,000 ft. Pitch-up also occurred at lower speeds. Even Bob Little experienced it when he nearly pitched-up on take-off from Lambert Field. Korean War ace Maj Lonnie Moore did lose control of his F-101A on take-off when the nose over-rotated and pitched-up on his first check flight at Eglin AFB, Florida, causing a fatal crash, and McDonnell test pilot Bill Ross also entered a flat spin in 53-2419 but ejected safely.

After 200 spin-recovery tests with two F-101s, McDonnell established procedures for avoiding pitch-up and recovering from it, but in all cases this was only possible if there was sufficient altitude. Pilots at that time felt that the aircraft's ejection seat was unreliable at altitudes below 9000 ft. Extending the braking parachute was usually necessary too, although it would separate at around 240 knots. Neutralising the controls could cure yaw, roll and spin if there was enough altitude, but recovery from a

F-101A-30-MC 54-1460 displays the basic Voodoo configuration, with the four-gun fighter nose and five large fuel cells occupying much of the central fuselage and the inner leading edges of the wings. Mounting the engines low in the fuselage simplified maintenance. This particular aircraft later adopted the red tail markings of the first operational USAF squadron, the 522nd TFS/27th TFW, in August 1957. It was later transferred to the 81st TFW at RAF Woodbridge and RAF Bentwaters in England and eventually converted into an RF-101G photo-reconnaissance aircraft for the 154th TRS of the Arkansas ANG. The jet served with the latter unit from 1968 through to June 1972, when it was sent to the MASDC at Davis-Monthan AFB for storage. It was salvaged there in April 1975 (*USAF*)

stall at 30,000 ft could take up to 12,000 ft, or 6000 ft if it began at 10,000 ft. Pilots were told to operate the controls smoothly to avoid sudden AoA increases and apply 'full forward stick' with neutral ailerons if pitch-up seemed imminent. The condition occurred very quickly and without warning at supersonic speeds.

A longer-term aid was provided by a stall-warning system, as F-101 automatic flight control system (AFCS) technician Neil Byrd recalled;

'At a certain AoA a warning would show [as a yellow light] and sound [as a klaxon] in the cockpit, and beyond that, at a defined angle, the AFCS would drive the stick forward regardless of pilot input, which seemed like a rather drastic solution. When the aircraft had entered a pitch-up situation the only recourse was to deploy the drag 'chute and hope there was 10,000 ft altitude for recovery.'

The so-called AFCS 'stick knocker', or pitch inhibitor, could not remedy the jet's basic aerodynamic problems, but it gave pilots a better chance of avoiding them. However, the difference between the AoA needed to maintain lift at high altitude when the aircraft had external stores and an angle that could cause pitch-up was dangerously small. It was therefore surprising that when the Voodoo faced the threat of North Vietnam's MiG-17s in 1965, Second Air Division commanders reassured the Commander in Chief, Pacific Air Forces (PACAF), Gen Hunter Harris, that the RF-101C was highly manoeuvrable and quite able to evade the extremely agile communist fighter. By then, most F-101 pilots had long been reconciled to the pitch-up problem and the aircraft's basic inability to turn. Nevertheless, pitch-up situations continued to occur throughout the F-101's career.

While pitch-up inevitably remained a problem, and earned the jet a poor reputation for ease of handling, its undercarriage also required cautious treatment. With spectacular acceleration on take-off, even without afterburner it reached the gear-limit speed of 250 knots very quickly, and the forward-retracting nose gear would stay extended if that speed was exceeded. Pilots would attempt to fold the gear up seconds after take-off and pull the nose up to reduce speed without exceeding AoA limits as they began to reach best climb speed within one minute. Very light stick forces were needed on take-off, requiring fine judgement to prevent over-rotation and pitch-up. A safe approach and landing required absolute adherence to the textbook figures or an unrecoverable sink rate would quickly develop.

Other problems arose with the main landing gear, which on F-101A/C models tended to collapse under torque if the aircraft turned sharply while taxiing. Its hydraulic retraction cylinder was also the main side-load brace for the main landing-gear unit and it could wear out quite fast. The undercarriage of the two-seat F-101B interceptor was subsequently reinforced and other variants were also given stronger retraction devices.

The F-101A and RF101A versions had an airframe that was able to withstand 6.33 g rather than the USAF's specified 7.33 g – a difference that was rectified in the reinforced (and 500 lbs heavier) F-101C (and RF-101C), and comprised the main difference between the two variants. The RF-101C gained a reputation for great structural strength, which enabled it to survive numerous landing mishaps and mid-air incidents in the 1960s. The C-models also had slightly longer

afterburners and improved cooling of the rear fuselage that allowed virtually unrestricted afterburner use below 20,000 ft, rather than the six-minute limit for the F-101A, with 15 minutes use rather than ten minutes above 20,000 ft, followed by a five-minute cooling period instead of 20 minutes. This improvement was to be a vital one for the RF-101C's combat operations, as speed was the aircraft's only defence.

Many hours of testing by McDonnell test pilot Bert North were required for the various centreline pods, similar to those designed for the B-58 Hustler, which would be required for the F-101's and RF-101's long-range nuclear strike role. Here, F-101A-5-MC 53-2427 is carrying the 33 ft long, 9345-lb Model 96 'Configuration B' version, which contained 849 gallons of fuel in two cells and a 120-kiloton W-5 or more powerful W-27 thermonuclear warhead in its centre-section. Early tests in May 1955 showed that the Model 96 adversely affected the aircraft's stability and generated considerable transonic drag. The arrival of much smaller tactical nuclear weapons such as the Mk 28, which could be carried together with two 450-gallon drop tanks, allowed planners to abandon the Model 96 (*Author's Collection*)

McDonnell worked on a range of pods for the aircraft's single stores pylon, including the Model 102H that contained fuel, and a range of protective noise jammers such as the AN/ALT-8 and the AN/ALT-6, the latter featuring an AN/ALE-1 chaff dispenser. Another design (the Model 117A), with jammers and an AN/ALE-1, was devised for the F-101A and RF-101A, but all these stores created high transonic drag that had a negative impact on both handling and range. The pods and jammers, together with a number of more powerful nuclear store options, were therefore abandoned. However, testing of twin 450-gallon drop tanks mounted either side of a nuclear store began in February 1956 – these eventually became a standard fit for F-101s.

F-101A deliveries of 77 aircraft (excluding 27 for test purposes) to the 27th Strategic Fighter Wing at Bergstrom AFB, Texas, began in May 1957, but rather than providing SAC with strategic fighters the wing transferred to TAC on 1 July as the 27th Fighter Bomber Wing (FBW), and its mission became tactical nuclear strike. At the time, TAC's chosen strike aircraft was the Republic F-105B Thunderchief, which first flew in May 1956 and offered a large payload of conventional ordnance as well as nuclear capability. With a single Mk 7 nuclear store on its centreline and cannon ammunition, the F-101A was considerably less versatile than the F-105B, and it lasted only 18 months in 27th FBW service. It was replaced by the North American F-100 Super Sabre, which also carried a wide variety of tactical ordnance including new, smaller tactical nuclear weapons. Its tactical range was more than 250 miles less than the F-101's but it could achieve similar speeds at lower altitudes.

The 27th FBW's F-101As and many of the follow-on batch of 47 F-101Cs were transferred to the 81st TFW at the twin airfields of RAF Woodbridge and RAF Bentwaters, in Suffolk, during the autumn of 1958, and from here they stood on nuclear Victor Alert until January 1966. They were very much in a minority role within USAFE, which was generally converting to the F-100. Twenty-nine F-101As and 32 F-101Cs were later converted to the reconnaissance role as RF-101Gs and RF-101Hs, respectively. Ninety-six of the original F-101C production batch, with the beefed-up structure of that variant, were delivered as RF-101Cs out of a total run of 166 of the long-nosed camera-bearers.

Col Boyd L Van Horn flew F-101s at RAF Bentwaters for three years with Robin Olds, 'Chappie' James, Bill Kirk, John Burns and others who went on to occupy very senior positions within the USAF;

'I enjoyed my tour at Bentwaters more than any other in my 29 years. Robin, with his background and leadership abilities, put us at the top. The F-101 was a great airplane, very stable and perfect for the nuclear mission we had. My [assigned] target was four hours away with air refuelling over the North Sea at very low altitude, radio out. We practised our mission about two or three times a month and always flew in pairs for mutual support. The radar was very good for looking at ground targets. John Burns was an engineer and he developed a way of tilting the gyro to compensate for crosswinds so we got very good at practice bombing off the west coast of Ireland and at Wheelus AB [in Libya] a couple of times a year. We would go low-level north of Tripoli and then turn left towards two large circles cut in the desert. Our approach was at 500 knots at 50 ft, and when we got the pull-up signal we would pull 4 gs. The [practice nuclear] bomb released almost straight up and went to 40,000 ft. We would do an Immelmann [turn] and dive back to the deck to get at least five miles away because of the over-pressure of a one megaton bomb.'

VOODOO CAMERAMEN

A secondary nuclear role was still considered when McDonnell produced specifications for a reconnaissance version of the F-101A within weeks of receiving the initial contract for the fighter, and, like the A-model, it was originally intended to join SAC. The USAF's Air Research and Development Command (ARDC) initially contemplated various detachable camera nose configurations to fit the standard F-101A, but the size of the specified KA-1 cameras dictated an extension that would have created aerodynamic balance problems. Reconnaissance Voodoos got their long, wedge-tipped noses from the decision to use the heavyweight KA-1 or KA-2 cameras in that position.

ARDC responded to McDonnell's 12 February 1952 specification outline with an October 1952 request for a reconnaissance F-101A capable of day and night photography and using the fighter's AN/APN-81 navigational equipment, although the latter was controversially deleted in May 1953. An AN/APN-22 radar altimeter was added in April, however.

Part of the initial reconnaissance Voodoo production batch, RF-101A-20-MC 54-1496 with two 450-gallon tanks underslung pulls up its undercarriage on take-off in 1957 before delivery to the 363rd TRW. By the time it was retired in May 1968 at Shaw AFB, this aircraft had been camouflaged, with its last four serial digits applied in white on its tail (*USAF*)

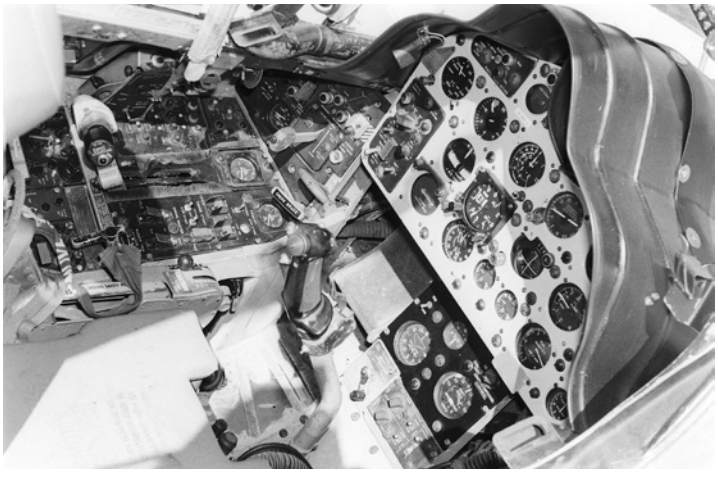
By January 1953 the camera complement had been settled at two 36-inch focal length Fairchild KA-1s with 9-inch x 18-inch film in a 'split-vertical' high-altitude configuration housed in the lower fuselage behind the cockpit. Their location required some changes to the fuel tank originally installed in that area of the airframe. Up to four KA-2 12-inch or 6-inch focal length, 9-inch x 9-inch format cameras were installed in the nose for low-altitude work at night, possibly using internally stowed flash cartridges. Three of the KA-2s were in a tri-camera, downward-angled configuration and one looked forward from the window at the tip of the nose. The pilot could see the view provided to the three KA-2 tri-camera units by looking through his VF-31 viewfinder. The KA-1 was effective at altitudes above 21,000 ft, although it needed A-25 film magazines with image motion control at that height. KA-2s, although generally reliable, worked without image motion compensation at around 2500 ft and 600 knots. Blurred images were commonplace as a result. A new system was devised for the McDonnell RF-4C, which replaced the RF-101C in most units, and plans were made to retro-fit the blur-free equipment into RF-101Cs. The early cameras also suffered from heat and vibration damage to plastic components in their structure during high-speed flight.

An electric elevator system lowered the cameras from the nose compartments so that film packs could be removed quickly and put in the base's 'bread van' for speedy delivery to the processing laboratory. In 1962 most RF-101Cs did have a camera re-fit which replaced the KA-1s with a pair of KA-47 12-inch focal length cameras and substituted high-resolution KA-45s for the KA-2s in the nose.

Two YRF-101A (Model 36X) Voodoos (54-149 and 54-150) were ordered in October 1953 with the nuclear-related weapon system designator WS-105L. Mock-up inspection in January 1954 brought agreement that there was insufficient internal space for flash cartridges, re-assigning the aircraft to daylight-only operations as the USAF considered that external photoflash pods would be impractical. However, it was decided in August 1956 that the aircraft should be able to carry two external ECM pods. The intended KA-3 cameras were deleted and so was the complex AN/APN-82 navigation system, severely reducing the aircraft's all-weather capability, but a radar altimeter and a ground-position indicator were specified. A Universal Camera Control system, originally intended for the rival RF-105B version of the Thunderchief, was also chosen rather than McDonnell's own less costly system, which was derived from equipment built for its F2H-2F.

During 1956-57, the YRF-101As tested revised Type IIa air intakes, a 'buddy' in-flight refuelling pod, wing-root modifications and even

OPPOSITE
Capt Ray W Schrecengost Jr's RF-101C-40-MC-56-0166 *Sun-Run 4* is poised on the runway in the early morning at Ontario Airport, California, as the first Voodoo to take off for NAS Floyd Bennett, New York, on the *Sun-Run* record attempt, which was organised by Maj Stanley Sebring to beat the sun's time to cross the North American continent. The aircraft, decorated with yellow (FS 13538) markings, was nicknamed *CIN-MIN* (on its left side beneath the cockpit) after the pilot's two daughters Cindy and Mindy. Schrecengost Jr claimed a new record speed, averaging 749.950 mph on the run to New York and beating the record held by the US Marine Corps' Maj John Glenn. His time for the round trip was also a new record, but both were beaten by later *Sun-Run* flights. This aircraft went on to fly many missions in Vietnam, where it acquired the nick name *LUV-BUG!* while serving with the 45th TRS. It was eventually put on display in the National Museum of the USAF at Wright Patterson AFB, Ohio (USAF)



The cockpit of RF-101C 56-0198, with the cassette ejection system control panel for the KA-56 camera system (installed for combat use in Project 1181) on the lower left of the main panel and the AN/APR-25 warning panel at the top left. The engine control panel and throttles are on the left side-panel, with camera controls behind them. On the rear of the control column grip is the camera operating switch and auto-pilot release. The large camera view-finder is hidden under the glare-shield at the top of the main panel. The top left circular dial is the vital radar altimeter (*Terry Panopalis Collection*)

In one of the first uses of a routine that was to be repeated thousands of times during the RF-101's career, Capt Schrecengost Jr's *CIN-MIN* receives fuel from a flying boom-equipped KC-135A tanker. Staying on the boom as the aircraft was filled and its weight increased often meant use of one afterburner. In their early overseas deployments, RF-101s were more often required to 'mate' with piston-engined KB-50s using probe-and-drogue refuelling systems (*USAF*)

an extra set of main wheels that could be jettisoned after take-off. When the production RF-101As, which were originally intended for SAC, were re-allocated to TAC, that command had to abandon its chosen RF-105B, which offered even better performance, potential gun armament and greater versatility, despite considerable development work that had been devoted to the Republic reconnaissance-fighter and also to the RF-104A. Fortuitously, the RF-101A was in place, as long delays occurred in the F-105's development and the RF-105B and RF-104A would be cancelled, allowing later production F-101A/Cs to be built as reconnaissance aircraft and replaced in the strike role by F-105Bs.

There were considerable delays with the chosen camera systems but the first RF-101A, 54-149, converted from the 16th F-101A on the production line, was rolled out in May 1955 and flown on 30 June. Type IIa intakes were included, and the only visible difference between it and production RF-101s was the long pitot boom on the left wingtip.

The subsequent delivery of aircraft (mostly without cameras installed) to the 17th Tactical Reconnaissance Squadron (TRS) and 18th TRS of the 432nd Tactical Reconnaissance Group (TRG) within the 363rd Tactical Reconnaissance Wing (TRW) at Shaw AFB, South Carolina, began with RF-101A 54-1504 on 6 May 1957 in parallel with the first F-101A deliveries to the 27th FBW. RF-101Cs, with the F-101C's reinforced wing structure and slightly different Type IIb intakes, were modified to carry a centreline nuclear store. They began to reach the 20th and 29th TRSs in September 1957 and soon replaced RF-101As with the 363rd TRW, also equipping the 4414th Combat Crew Training

Record-breaking RF-101C 56-0119 of the 432nd TRW averaged 700.047 mph (Mach 1.06) over a 1000-km course from Edwards AFB to San Francisco at 40,000 ft in Project *View-Do*. Capt Edward H Taylor's flight was made with Capt Jim Murphy (in RF-101C 56-0105, later to appear in Vietnam as *THE IRON EYEBALL* with the 45th TRS), but Murphy's flight was curtailed by fuel transfer problems (*NARA*)

Squadron (CCTS) from June 1958. With four squadrons on strength, the 432nd TRG became a reconnaissance wing in its own right in 1957.

That same year, as part of the 50th anniversary celebrations of the USAF becoming a separate branch of the armed services, TAC organised a transcontinental speed record attempt called *Sun-Run* for the RF-101C in an effort to better the time set by US Marine Corps pilot Maj John Glenn in a Vought F8U-1P Crusader in July 1957. Practice runs were made with an F-101A and the USAF's first two KC-135A tankers, which were then still being tested at Edwards AFB. When RF-101Cs began to arrive at Shaw AFB in September 1957, six were allocated to *Sun-Run*. Six RF-101As also flew practice sorties, and it was calculated that 24 in-flight refuellings would be needed from the now in service KC-135A tankers, four per aircraft each way. The aircraft had to stay in minimum afterburner to maintain supersonic speed at 45,000 ft, and this required a refuelling session every 27 minutes! The practice refuelling sessions yielded valuable experience for the future, although poor coordination with the tankers caused fuel starvation problems for several pilots.

Sun-Run, using six standard RF-101Cs, all marked with yellow, blue or red/orange stripes, began on 27 November 1957, and the Los Angeles to New York record went to 29-year-old 1Lt Gustav B Klatt in 3 hrs 7 mins 43.63 sec. A navigational error by the refuelling force meant that he was down to 500 lbs of fuel when he met his final tanker. The round trip record from Ontario Airport, Los Angeles, to NAS Floyd Bennett, New York, and back was set by Capt Robert Sweet in 6 hrs 46 min 21 sec. It was an impressive demonstration of the Voodoo's scorching performance, and 'Gus' Klatt's record stood for three-and-a-half years until it was bettered by an F4H-1 Phantom II. His aircraft (56-0165) later became a victim of the Vietnam War when it was shot down on 5 December 1966 near Yen Bai airfield and Capt Arthur Warren ejected. Initially listed as Missing in Action, his remains were recovered in September 1986.

Further world speed records were established in April 1959 in the aptly named Project *View-Do*, with Capt Edward Taylor flying RF-101C 56-0119 at an average speed of 700.047 mph over a 1000-km closed course at 40,000 ft on 8 April and Capt George Edwards using the same aircraft to average 816.28 mph on a 500-km closed course one week later.

CHAPTER TWO

INTO SERVICE

RF-101A-30-MC 54-1515 of the 837th AD was assigned to Brig Gen Stephen Mack, who led many of the early RF-101 deployments, including Operation *Mobile Zebra* to Yokota AB, Japan, in November 1957 and the CASF deployment to Incirlik AB, Turkey, during the 1958 Lebanon Crisis in Operation *Blue Bat*. The transatlantic flight from Shaw AFB for *Blue Bat* was beset by bad weather and technical problems, although the six-strong RF-101A/C force (including record-breaking pilots Capt Schrecengost Jr and 1Lt Klatt) eventually arrived at Incirlik AB. Over Lebanon, Klatt's aircraft became the first of many RF-101Cs to sustain damage from enemy fire (*USAF*)

America had little use for military reconnaissance in the years following World War 1, in which the US Army had used a limited number of observation balloons and DH 4 aircraft during fighting on the Western Front. However, US participation in World War 2 required the creation of tactical reconnaissance units and the development of aircraft to equip them. Many, such as the Lockheed F-5 Lightning and North American F-6 Mustang were modified fighters, and they were succeeded post-war by camera-carrying versions of the P-80 jet fighter and Douglas FA-26 (RB-26) bomber that served well during the Korean War. They were built in small numbers, and the USAF had only two jet-equipped reconnaissance units in 1950, together with the 45th TRS 'Polka Dots' operating RF-51D Mustangs. In due course that squadron became a primary operator of the RF-101, as did the 8th TRS, which became the 15th TRS while flying RF-80As in combat in 1951. They pioneered low-altitude, unescorted solo photo-reconnaissance missions over heavily defended Korean territory. The arrival of North Korean MiG-15s required regular F-86 Sabre or RAAF Meteor fighter escort to be provided for the RF-80As as they made their high-speed photo runs, but many were still attacked by MiGs and losses to AAA were high.

The 67th TRW, managing the Korea reconnaissance operation, experimented with underwing camera pods for its RF-51Ds, Project

The 45th TRS 'Polka Dots', commanded by Maj Frank Lux, traded in its RF-84F Thunderflashes for RF-101Cs in mid-1958. The unit's new jets were marked up in this blue and white colour scheme over natural metal for seven years, similar colours having been applied to its RF-84Fs. In all, seven TAC squadrons operated RF-101Cs, and it was the Command's reconnaissance workhorse throughout much of the Vietnam War, although operated mainly by only two squadrons in Southeast Asia (*USAF*)

Honeybucket camera-equipped RF-86A Sabres and various photoflash installations for night-time photography. By 1953 the 45th TRS was an all-jet unit apart from RB-26 ECM-equipped aircraft that were used to plot enemy radar locations. Low-altitude flights in hazardous mountain landscapes and occasional exploratory sorties into China became routine, and the unit established tactics that would serve tactical reconnaissance pilots well for many years. The RF-101A might have also replaced RB-57A Canberras and the planned parasite RF-84Fs carried by GRB-36D bombers in making high-altitude reconnaissance flights over the Soviet Union, but by the time funding became available for that venture the high-flying Lockheed U-2 had arrived.

In Europe and Japan during the 1950s, pilots of *Heart Throb* Martin RB-57As, *Haymaker* RF-86Fs and *Slick Chick* RF-100A Super Sabres often penetrated Soviet and Chinese airspace for urgently needed reconnaissance data until the advent of MiG-19 fighters made their missions too hazardous. They photographed airfields, military and industrial installations, and revealed the vast improvements in Soviet early-warning radar networks. In USAFE, the 117th TRW initially flew RF-80As and RB-26A night-photo aircraft in 1952 like its Far Eastern counterparts. The wing eventually settled at Toul-Rosières, in France, and Fürstenfeldbruck, in West Germany, as the 10th TRW, which consisted of the 1st, 32nd and 38th TRSs.

The worsening Cold War situation also took the similarly equipped 66th TRW from Shaw AFB to Sembach, West Germany, in July 1953, while at the same time the 10th TRW moved to Spangdahlem AB, also in West Germany. Replacement of the wings' Korean War-era equipment began with the introduction of the RB-57A Canberra and RF-84F Thunderflash (the last fighter-reconnaissance conversion to retain guns) from 1954, while Douglas RB-66B Destroyers replaced some of the RB-26As in 1956. An additional squadron, the 19th TRS with the RB-45C Tornado at RAF Sculthorpe, in Norfolk, for clandestine flights over Soviet territory, was attached to the 66th TRW in 1957.

Far East-based Voodoos often had to undertake long-distance deployments, sending detachments to Osan AB, South Korea, and to Taoyuan AB, Taiwan, to assist in training RoCAF pilots. Exercise *Hand Clasp* in 1959 and Operation *Square Deal* in 1960 took 45th TRS detachments to Australia and New Zealand, and several aircraft returned with marsupial emblems stencilled beneath their cockpits. Pairs of 15th TRS RF-101s also flew to Tengah, Singapore, for exercises with RAF aircraft in 1963-64 (*USAF*)

TAC's rapid deployment CASFs, comprising fighter, strike and reconnaissance aircraft, were established in 1955 to tackle crises throughout the world. RF-101C-45-MC 56-0178 from the 20th TRS/363rd TRW, with red and black tail markings and yellow bands on its nose, deployed with F-100Ds, B-57s and B/RB-66s as part of CASF X-Ray Tango to the Far East in response to tensions over Taiwan in 1958 (*USAF*)

WORLDWIDE VOODOO

From 1957 RF-101s were assigned to the USAF's newly formed Composite Air Strike Force (CASF) units which were able to move quickly to trouble spots throughout the world, supported by tankers. The first RF-101 deployment outside the USA was also the type's first expedition to the Far East. In November 1957, Operation *Mobile Zebra* took five 17th TRS RF-101As from Shaw AFB in a CASF to Japan, with tanker support from drogue-equipped Boeing KB-50 tankers. It was a potentially hazardous venture, as the leader, Capt Martin Barnard, explained;

'The first leg was from George AFB, California, to Hickam, Hawaii, with point-to-point refuelling some 1000 miles out of George. If there was a foul-up after letting down to meet the tanker it was extremely doubtful that we could make it back to George.'

All the Voodoos completed the journey safely and, after arrival, flew several supersonic runs along the northern edge of South Korea to impress the North Korean government. A return visit in the summer of 1959 involved RF-101 low-level overflights of several South Korean towns.

Having armed Egypt's President Abdul Nasser, the Soviet Union began to build its influence in North Africa. President Dwight D Eisenhower promised to defend Middle Eastern countries such as Jordan and Lebanon that were threatened with communist take-over. The CASF 'Bravo' deployment in July 1958 included eight Shaw-based RF-101s deployed to Incirlik AB, Turkey, in Operation *Blue Bat* to support US Marines tasked with suppressing political tension in the Lebanon. Led by Capt Ray Schrecengost Jr the RF-101A/Cs initially headed for Chaumont, France, using very basic navigation to cross the Atlantic. One aircraft had to return with hydraulic problems, three lost their navigation lights and they all landed in a heavy rainstorm at Lajes, on the Portuguese island of Terceira in the Azores, having missed a refuelling session when the tankers did not appear. They continued on to Wheelus AB the following day, and from there to Incirlik ('the Lick') in Turkey.

Operating alongside seven Shaw-based RB-66Bs, the RF-101 pilots flew reconnaissance missions over the Lebanon until 19 October, when the three RF-101As and four RF-101Cs returned to Shaw AFB, preceded by the RB-66s. Their missions were considered to be the most effective part of the operation. On one, the Voodoo of *Sun-Run* pilot 'Gus' Klatt became the first to take a bullet during a low-altitude pass over the Lebanese coast. Four RB-66s, flying lower and slower, were also hit by small-arms fire.

The 20th TRS/432nd TRW deployed six RF-101Cs to Kadena AB, Okinawa, in late 1958, and the squadron would subsequently play a major role in the Southeast Asia air war when six aircraft were sent to Udorn RTAFB in May 1965 to augment the 15th TRS, which was assigned to the 432nd TRG (432nd TRW after 18 September 1966). RF-101C-55-MC 56-0201, which had initially served with the 38th TRS/66th TRW, later flew with the 15th TRS prior to returning to the 20th TRS. It was written-off in a hard landing at Udorn on 26 September 1966 (*Terry Panopalis Collection*)

The next deployment, in late August 1958, gave the 17th TRS RF-101s their first look at Vietnam. Communist Chinese shelling of the islands of Quemoy and Matsu in the Straits of Formosa in August triggered a US plan to hit up to 62 mainland Chinese targets, initially with tactical nuclear weapons, delivered by CASF X-Ray Tango. It comprised F-100Ds and B-57s together with 522nd TFS F-101A/Cs at Kadena AB, Okinawa, and supported by six (later, seven) Shaw-based RF-101s from the 17th and 20th TRSs operating on rotation from Clark AB, in the Philippines, and 83rd FIS F-104A Starfighters on Taiwan.

Although the nuclear element was soon ruled out, the RF-101s flew numerous show-of-force sorties over the islands. Two RF-101As, together with F-100 Super Sabres and KB-50 tankers that had not been available earlier in the deployment, made an overflight of central Saigon in South Vietnam. The Voodoo pilots involved took the opportunity to photograph potential targets, these images subsequently proving useful.

BOOM TOWN

As the confrontation with China calmed in November 1958, the CASF elements returned to the USA but four RF-101As were transferred to the Republic of China Air Force (RoCAF) under the Military Aid Program as part of the secret Project *Boom Town*. The latter commenced at the end of October 1959, its aim being to continue surveillance missions over communist China. Soviet-supplied MiG-19s and SA-2 SAMs increased the threat from mainland China and regular reconnaissance became vital.

Six RoCAF RF-101A pilots from the 4th Composite Reconnaissance Squadron (CRS), which also operated the RF-84F *Super Hog*, RF-100A *Slick Chick* Super Sabre conversions and a RB-57D, were trained by the 15th TRS at Kadena, on Okinawa, and they began to fly low-altitude, high-speed missions over China's increasing number of MiG bases. Aerial refuelling was available from USAF KB-50J tankers after 1965, and US assistance was given in selecting routes and targets, such as airfields and coastal naval facilities. Some of the photo processing, coded *Sentry Dog*, was undertaken at Yokota AB, Japan. The RF-101As were flown to the USA for deep maintenance.

The communist Chinese duly reinforced their AAA defences as a direct result of these overflights, and on 2 August 1961 they shot down 54-1498, making it the first Voodoo combat loss. The pilot, Maj Wu Pao-tze, was captured. Another, 54-1519 (coded 5656 in RoCAF service), was shot down by a MiG-19 on 18 March 1965. RF-101A operations by the small 4th CRS unit continued until August 1973, with four ex-45th TRS RF-101Cs being supplied to boost the unit's strength.

USAFE

In January 1958 the 66th TRW was told that it would receive the RF-101C for its 32nd and 38th TRSs at Phalsbourg-Bourscheid AB, France, and move its 302nd and 303rd TRSs to Laon-Couvron, also in France. An RF-101C Mobile Training Detachment was established within the 66th TRW at Phalsbourg-Bourscheid, where the first four USAFE RF-101Cs from Shaw AFB's 17th and 18th TRSs arrived on 16 May 1958, before the wing headquarters moved to Laon-Couvron in July. On arrival, the lead RF-101C flown by Col John Foster suffered a control failure during the carefully planned break and landing flypast. He ejected as his Voodoo entered a flat spin. After this unpropitious start, the 32nd completed an accident-free conversion by December 1958 in the favourable climate of Nouasseur AB, in Morocco, where USAFE RF-101 squadrons would perform training sorties. The 38th TRS had also converted at the desert base by March 1959.

On one training run an RF-101C pilot photographed MiG-17s being delivered to the Moroccan Air Force, and in 1960 the 18th TRS collected photographic coverage of earthquake damage around Agadir that helped to generate charitable donations. Upon returning to Phalsbourg-Bourscheid and its less favourable climate, the wing suffered several accidents in 1959, with uncontrollable pitch-up being a contributory cause in at least one crash. This problem persisted throughout the Voodoo's career. On 29 July

Four RF-101As were supplied to the RoCAF to replace RF-100A Super Sabres in 1959. Basic national markings covered the original USAF ones, although the 'shadow' of a *U.S. AIR FORCE* logo was visible on one example. The pilots were trained at Kadena AB and they began to patrol coastal areas of the Chinese mainland in low-altitude, high-speed sorties that captured images of airfields and defence installations. Two RF-101As had been shot down by 1965 and replacements were duly supplied from USAF stocks (*Author's Collection*)

1966 460th TRW RF-101C 56-0201 returning to Udorn Royal Thai Air Force Base (RTAFB), Thailand, after a combat mission pitched-up and crashed when its pilot (who was severely injured in the accident) tried to pull up and overshoot because the runway was obstructed. A similar pitch-up landing accident at Udorn accounted for 56-0063 on 12 March 1967, although pilot Maj Don Miller of the 20th TRS survived.

After suffering the underpowered RF-84F for two years, the 66th TRW greatly appreciated the far superior RF-101Cs flown by the 17th and 18th TRSs, which were transferred into USAFE from Shaw AFB as replacements for the 302nd and 303rd TRSs – the latter two units duly deactivated in June 1959. They flew to Laon-Couvron in May 1959, losing two aircraft en route in a mid-air collision at 35,000 ft over the Atlantic that severed the tail from one aircraft and the nose from the other. Both pilots, Lts Paul Carrodus and Lee Skinner, were lucky to be recovered by USCGC *Mendota* after being spotted by a WB-50 Superfortress on a weather patrol from a base in North Africa. The wing, despite its secondary nuclear capability, remained at Laon-Couvron after the 10th TRW (with RB-66s) and other USAFE units were compelled to leave France following new limits placed by its government on the type of American forces stationed on its soil. Specifically, USAFE's nuclear-capable aircraft were to be removed from French bases.

The 66th TRW practised low-altitude daylight photo- and visual-reconnaissance runs with a high-altitude target approach and egress, recognising that they lacked ECM warning of SAMs and that they were subject to European weather, which often ruled out medium- or high-altitude photo-reconnaissance. Practice missions often required up to 40 minutes of flight at 500 ft or less at speeds of 420 knots. With 'tweaked' engines, the RF-101C was capable of 645 knots at low altitude. Visual reports on the mission's revelations were transmitted to base on the return journey.

Flights along the East German border required very precise navigation to avoid straying into hostile territory, which held the very real threat of MiG interception. Fortunately for RF-101 pilots, the aircraft's side-angled oblique cameras could record useful imagery for some distance into

The 66th TRW's 1961 colour scheme of a black tail-band with white outline was replaced in 1963 by decor incorporating a yellow star on a circular blue background, which was in turn replaced by the wing badge and a veritable rainbow of stripes as seen here on RF-101C-55-MC 56-0216. By 1966 these colourful markings had generally been obliterated by Southeast Asian camouflage. 56-0216 spent five years in 66th TRW service before being transferred to the 363rd TRW in 1968 and finally ending up with the 165th TRS of the Kentucky ANG in 1972. It was eventually retired to the MASDC in April 1976 and salvaged in October 1984 (*Terry Panopalis Collection*)

The application of camouflage was a gradual process, as this flight of Project 1181-modified 66th TRW RF-101Cs shows. Two 450-gallon drop tanks were standard for virtually all missions, and the aircraft could still attain 500 knots with them in place at low altitude. Two types of tank were used, including the longer version with an elongated rear section seen here. With its J57-P-13 engines tuned up to 102 per cent power, rather than the standard 93 per cent, an RF-101C could reach 645 knots at low altitude, although fuel consumption was punitive at such settings (*USAF*)

forbidden territory. Although USAFE fighters were never far away if border incursions (accidental or deliberate) by either side occurred, in 14 years up to 1964 more than 100 US airmen were lost on these border-patrol flights. RF-101C pilots also had to shake off pursuing MiGs on at least one occasion in 1964.

The tactics and expertise developed at this time would be invaluable in Vietnam, where many of the aircraft and their 66th TRW crews would eventually see combat with some of the eight operational RF-101 units that had been established by mid-1959. Their hard-won specialist skills were highly prized in a reconnaissance community that the USAF tried to keep together throughout the long-running Vietnam War period.

Capt Paul Subbie, a USAF reconnaissance pilot from 1965 to 1977, completed 100 combat missions in the RF-101C with the 45th TRS;

'I loved the Voodoo, but some pilots called it a bunch of nuts, bolts and aluminum flying in loose formation because of the sounds it made when airborne. I had the opposite opinion, finding it quiet, reliable and a steady photographic platform. In its early stages it was plagued with hydraulic and landing-gear problems, but most of these issues had been resolved by the manufacturer, USAF or crew chiefs by the latter days of the Vietnam War. The Voodoo I flew did just what I asked of her and got me home safely after all my missions. It did have a few "unusual tendencies", and a savvy pilot got to know his plane well and was aware what to be cautious about. It had a tendency to pitch-up, and a number of accidents were attributable to this quirk. It could catch you off guard if you were unfamiliar with it or got complacent.'

CASTRO'S CRISIS

Soviet premier Nikita Khrushchev's attempts to foment discontent in North Africa, Latin America and particularly in Cuba to distract the USA and disguise the weakness of his own regime, precipitated his choice of an easy political target. The Berlin Wall and the blockade of the city in August 1961 provoked a confrontation in which the nuclear option was a serious threat. The 81st TFW's F-101s were allotted specific air defence targets for their tactical nuclear weapons and eight 66th TRW RF-101s were detached to Spangdahlem AB. Solo RF-101Cs flew regular missions along the two designated air corridors to and from Berlin, often escorted by MiGs that tried to persuade them to stray across the Air Defence

Identification Zone into East German airspace, where they could be legitimately attacked. The wing's 38th TRS pilots, operating from Ramstein AB in West Germany and later from Sembach AB, also trained in their secondary role – the low-altitude delivery of Mk 28 and Mk 43 tactical nuclear weapons.

The Cuban Missile Crisis in late October 1962 involved RF-101As from three 363rd TRW squadrons, including 54-1516, seen here at Shaw AFB, South Carolina, awaiting deployment to McDill AFB, Florida. Commanded by Col Arthur McCartan, the Voodoo wing flew 82 missions from the crowded Florida base, some of them requiring more than an hour of photo runs across Cuba with in-flight refuelling to and from the island. The US Navy's RF-8A Crusaders produced more useful imagery at the beginning of that period, although hasty modifications to the Voodoos' camera installation by Chicago Aerial Works soon improved photo definition (*USAF*)

In Britain, F-101Cs of the 81st TFW 'forward based' at Bentwaters and Woodbridge were armed with Mk 43 nuclear stores and stood on alert to take part in a NATO strike force if required. The tense political situation also revived the RF-101C squadrons' secondary nuclear role, the four 66th TRW units training at Wheelus with 3000-lb Mk 7, Mk 28RE and Mk 43 nuclear weapons in low-altitude delivery tactics, although no actual 'nukes' were carried. The RF-101C's very basic bombing computer ruled out the usual low-altitude bombing system nuclear-delivery technique used by F-101Cs, so a simple low altitude drogue delivery was used with Mk 43s, dropping the weapon from 100 ft at speeds in excess of 400 knots on what most pilots acknowledged was a one-way mission in reality. They also tended to regard this training as a distraction from their true reconnaissance task.

However, as 'cameramen', their low-altitude, high-speed tactics continued to provide their best way of avoiding detection by enemy fighters and ground defences, although the proliferation of SAMs such as the SA-4 and SA-7 and radar-controlled 23 mm ZSU-23 AAA in the 1960s would have reduced their chances of completing their missions 'down low'.

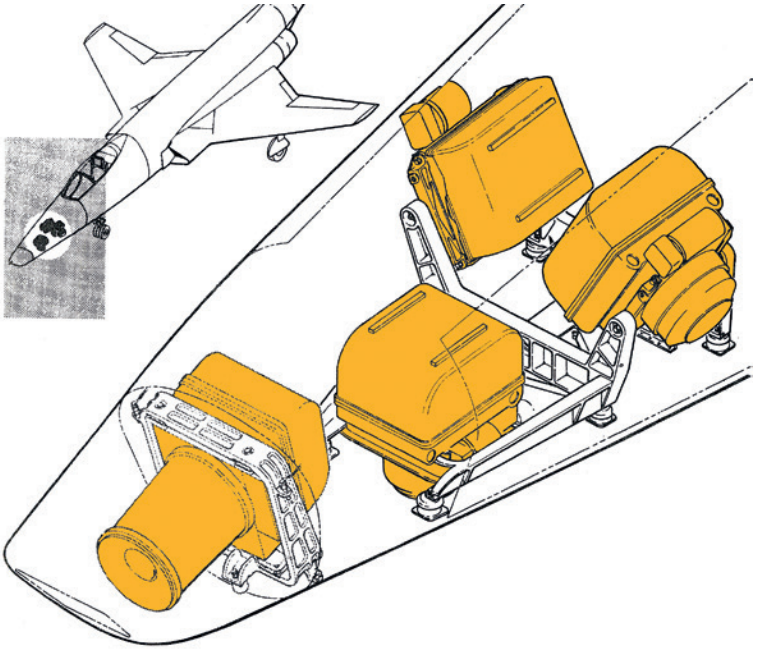
Khrushchev extended his threats against America by locating medium-range ballistic missiles in Cuba, and the ensuing Missile Crisis of October 1962 gave US forces their first major test since the Korean War. The 363rd TRW was involved from 21 October, when the wing deployed Voodoos to MacDill AFB, Florida, six hours after its first alert notice. Led by Col Arthur McCartan, the wing's role was to supply detailed photographs of the Soviet missile sites that were then still under construction. A U-2 mission on 29 August had provided a photographic mosaic of the country, showing eight SA-2 sites being built. More sites and 40 MiG-21 fighters were revealed in another U-2 flight on 5 September, and Il-28 'Beagle' tactical bombers, which were much later found to have been equipped with RDS-4 nuclear weapons, were photographed being assembled at San Julian airfield.

Flights over the island by pairs of RF-101s began on 26 October, three days after US Navy RF-8A Crusaders of VFP-62 had commenced monitoring Soviet activity in Cuba as part of Operation *Blue Moon*. Shaw's 9th TRS RB-66Cs and 16th TRS RB-66Bs also stood alert at

MacDill – where more than 200 aircraft rehearsed large-scale strikes on Cuba – to provide further photographic and night-flight electronic intelligence. Operation Plan in Complete Format 312, recommended by the Joint Chiefs of Staff, included air strikes followed by a ground invasion of Cuba one week later. The volume of small-arms fire aimed at the reconnaissance aircraft up to 29 October showed that such a move would be strongly opposed.

The US Navy specialised in low-altitude, high-speed photo-reconnaissance using Chicago Aerial Industries KA-45 4.5-inch x 4.5-inch format cameras, whereas the USAF had optimised its tactical reconnaissance aircraft for medium and high-altitude operations. The initial Voodoo sorties yielded disappointing results as their large-format 9-inch x 9-inch KA-2 cameras did not produce useable images during fast, low-altitude sorties due to mismatches between camera settings, speed and altitude. Image blurring occurred at altitudes below 500 ft, and some missions were flown at 200-250 ft, with camera settings for higher altitudes. The KA-2 system was optimised for altitudes of around 850 ft at 400 knots, or 1300 ft with the RF-101 flat out at 637 knots – its maximum sea-level speed, which was considered necessary over Cuba to avoid the SA-2 missile threat. Clear imagery from an altitude of 200 ft could only be ensured by flying at about 250 knots. The RF-101's KA-1 system, derived from the K-38 used in the RF-84F, was effective at 14,000 ft and 400 knots, or up to 786 knots at 28,000 ft.

The RF-8A pilots also cast doubt upon the ability of USAF photo interpreters (PIs), and they were annoyed that the USAF crews, unlike the Crusader pilots, were allowed to discuss their mission with the Press. This gave the impression that the Voodoos' contribution was the main one, even though they flew comparatively few sorties.



A typical early configuration for the RF-101's forward camera installations. Compartment 1 in the nose held a forward oblique 12-inch focal length KA-2 framing camera with a vertical angle of view of 41 degrees. It was most useful for low altitude 'dicing' photography, using a Rapidyne high speed shutter and producing 9-inch square negatives. Behind it in Compartment 2 was a 'fan' array of a KA-1 18-inch focal length vertical frame camera and two oblique KA-2s with 6-inch focal length lenses, giving horizon to horizon coverage on 390 ft of film in A-9B magazines. A large viewfinder was also installed behind the KA-2 position. Two more KA-1 36-inch cameras were 'swing mounted' behind the cockpit in Compartment 3 for split vertical views to 28 degrees each side of the centreline. Lenses of different focal lengths could be fitted and the cameras could be replaced by Hycon KS-72 frame cameras (Compartment 1 and 2) or KS-56, KA-18 strip cameras, KA-46 night cameras or a T-11 mapping camera (Compartment 2). The panoramic KA-56A camera was added in Project 1181 from 1963 (*USAF*)

After the downing of a U-2 (and the death of its pilot, Maj Rudolf Anderson) by an SA-2 during a flight over Cuba on 27 October, President John F Kennedy approved retaliatory strikes on SAM sites and MiGs. However, before these could be flown, Khrushchev ordered his forces to stand down after he realised that his plans to keep the missiles a secret had failed. Reconnaissance overflights continued so as to verify the removal of Soviet weapons, although United Nations' (UN) insistence on using a neutral reconnaissance force rather than USAF/US Navy flights curtailed the operation briefly until 29 October, when RF-101 and RF-8 camerawork

RF-101C-50-MC 56-0187 in basic TAC markings while serving with the 363rd TRW shows off its full range of cameras. Split vertical KA-1s, each weighing 150 lbs, have been lowered mechanically from their bay behind the cockpit – freestanding examples of the KA-1 are also clearly visible in the centre of the display line-up in the foreground. A 6-inch focal length KA-2 is angled sideways from the forward bay and a 12-inch KA-2, with its A9B film magazine, is visible in the nosecone's oblique position. This could be replaced by the small-format KA-45 (*USAF*)

showed that construction was still very much underway at several SS-4 nuclear-missile launch sites. A further UN halt to US flights delayed further verification sorties until 2 November, when it became clear that Il-28 bombers were still being assembled in Cuba.

On that day an RF-101C was modified with a World War 2-era K-18A camera that passed a film strip over an aperture slit at a constant speed that matched the ground speed of the aircraft over its target, producing clear imagery in one continuous photograph. Several more Voodoos were equipped with K-18As, using a stereoscopic facility, and they began missions on 10 November to monitor the continued assembly of Il-28s.

A better photographic solution to the RF-101's low-altitude image clarity problems was found by borrowing 24 of the US Navy's lighter, smaller-format KA-45s. One of these was duly used as the 6-inch focal length forward-oblique camera in the nose of the Voodoo. Two more 6-inch side-oblique KA-45s and a 3-inch vertical KA-45 were also installed in the second camera compartment. KA-45 installations could cope with rapid image motion at altitudes below 500 ft. KA-45s had already been installed in four 15th TRS RF-101Cs at Don Muang RTAFB in a trial fitting as part of Project *Toy Tiger* for the Operation *Able Mable* reconnaissance effort in Southeast Asia, which had commenced in October 1961.

The highly persuasive USAF Chief of Staff, Gen Curtis LeMay, who had advocated bombing of Soviet installations in Cuba, insisted that the KA-45 cameras should be supplied to the 363rd TRW at MacDill so that the USAF's reconnaissance effort would not be overshadowed by the US Navy. More aircraft had the KA-45 high-speed cameras installed after the Cuba affair.

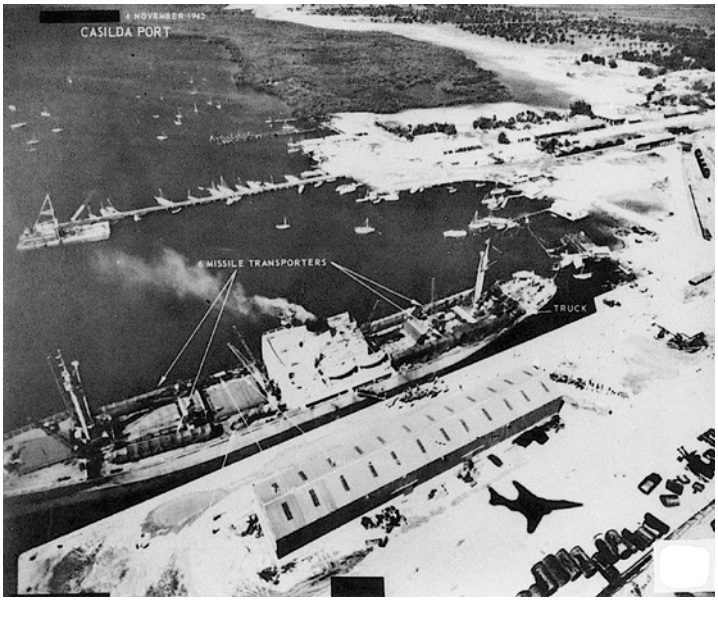
Toy Tiger Voodoos also had 12-inch focal length KA-47 split vertical cameras (which worked better at night) in place of their KA-1s, and a C-1 photoflash detector to operate with a pod of 80 M-123 photoflash cartridges, carried externally on an MB-7 centreline rack. The pods, like many of the initial KA-2 units, came from redundant RF-84F Thunderflashes. The aircraft were also modified for TLQ-8 jammers. On 3 November 1962 the *Toy Tiger* RF-101Cs were temporarily transferred

to the USA after a few introductory missions from Don Muang for possible use over Cuba.

One advantage the RF-101C had over the RF-8A was that it had an AN/AHN-2 voice recorder system installed to log the pilot's visual observations and any audio signals from hostile ground radars. When heavy defences, particularly those that Voodoo pilots would have encountered in Europe, made photo-reconnaissance too hazardous, a timely verbal report could be valuable in assessing a tactical situation on the ground. The jet was also fitted with a useful APN-102/ASN-7 Doppler/Dead Reckoning navigation unit.

The first pair of RF-101s to fly over Cuba had attracted AAA fire, and some MiG opposition was also encountered as flights over the Il-28 base were made on 5 November, although no interceptions were attempted. Pilots photographed up to eight targets on missions involving six RF-101Cs. On 15 November, while assembly work on the Il-28s still continued, Cuban leader President Fidel Castro said he would shoot down any further reconnaissance flights. The belief that the SA-2's 'Fan Song-C' guidance radars could apparently track targets at 200 ft and 800 knots made this a credible threat, so RF-101 flights were suspended and the monitoring task reverted back to the U-2-equipped 4080th Strategic Reconnaissance Wing.

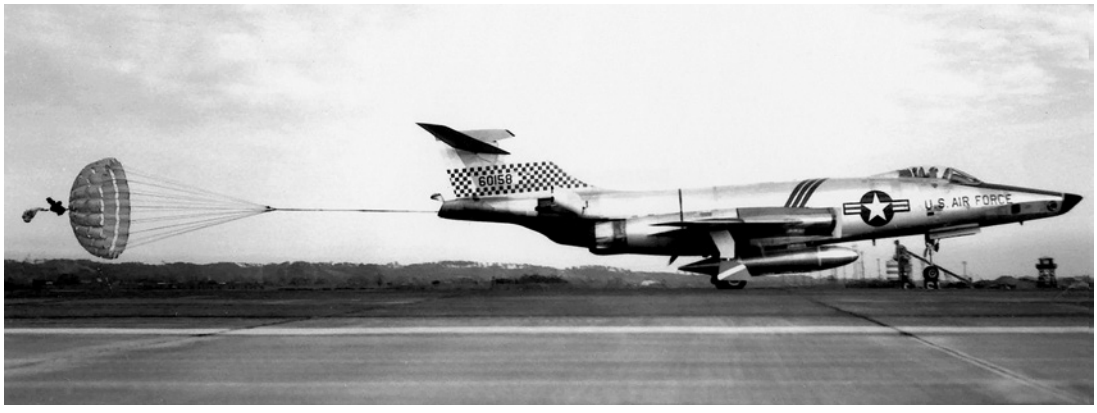
Twelve 363rd TRW RF-101Cs from the 20th and 29th TRSs, a few of them in experimental camouflage schemes, were retained on standby in an operation known as *Aunt Mary*. More than 40 RF-101s had been deployed to MacDill by mid-November, allowing pilots to complete 82 flights over Cuba by the 15th of that month. Most of these missions had seen the aircraft flying at below 500 ft. The 363rd TRW generated more than 39,500 images for analysis by experts at Andrews AFB, Langley AFB (the CIA) or in Washington, DC (the Pentagon). Some aircraft remained at MacDill until mid-December.



The 'footprint' of an RF-101A is visible on this photo of Soviet missile transporters being loaded onto a freighter at Casilda port, Cuba, on 6 November 1962. Twelve low-level missions by RF-8As and RF-101s were authorised that day, as well as five U-2 sorties, to monitor the removal of Khrushchev's SS-4 (R-12) 'Sandal' and SS-5 (R-14) 'Skean' missiles (*DoD*)

The improvements to the aircraft's reconnaissance suite prompted by problems encountered during Cuban operations brought about Project 1181, which McDonnell instigated in February 1963 to improve the RF-101's low-altitude reconnaissance performance. The upgrades added useful capability for the Voodoo's Southeast Asia operations from 1964.

Moving beyond the previous *Toy Tiger* changes, the new specification, intended as a modification to the whole RF-101 fleet, used elements of the reconnaissance suite planned for the RF-4C Phantom II and added the uprated J57-P-55 engines that were being installed in the two-seat F-101B interceptor, providing another



A safe recovery for 432nd TRW RF-101C 56-0158 at Udorn. Pilots found that the RF-101 had to be flown 'by the book', with little room for error. Landing gear and flaps were lowered below 250 knots and a speed of 220-230 knots was needed on the base leg at a normal 30,000-lb gross weight with a glide-slope angle of 2.5 to 3 degrees, giving a descent rate of 900 ft per minute. Speed brakes could be used to establish a touch-down speed of 140-150 knots and the brake 'chute was extended at that point. Keeping the nose high helped with aerodynamic braking and the nose-wheels were lowered onto the runway at about 110 knots. With the nose raised, strong wind gusts could make the aircraft pitch-up and the pilot then had to use his braking parachute to correct the angle of attack (*USAF*)

3800 lbs of afterburning thrust. KA-1 split vertical cameras with their big, high-definition 9-inch x 18-inch format were retained, but the KA-2 fit was replaced by a 'fan' array of 4.5-inch x 4.5-inch Hycon KS-72A framing cameras, intended for the RF-4C, with automatic exposure control for daylight and night use, image motion compensation and manual back-up.

The complex KS-72As, with a maximum shutter speed of 1/400th of a second in daylight, had a difficult introductory period and suffered from delays in the supply of parts, camera drive mechanism failures and susceptibility to moisture in the steamy climate of Southeast Asia. Tests in an RF-101C revealed these inadequacies, and this in turn slowed down the deployment of the 45th TRS's revised aircraft to Tan Son Nhut AB in South Vietnam and required the 15th TRS to 'hold the fort' there longer than originally planned. In its KS-72C1 version, which could accept 3-inch or 12-inch lenses, the camera eventually gave the required results at low altitude and above 20,000 ft. On a few missions a KA-1 was installed in the nose oblique position to locate coastal defences in low-altitude runs.

A fifth camera station behind the nose oblique position contained a horizon-to-horizon KA-56 3-inch focal length panoramic camera with a rotating prism mounted in a wedge-shaped transparency below the RF-101's nose. It was prioritised for low-altitude use and produced big, horizon-to-horizon images measuring 41 inches x 9 inches at the rate of six per second at shutter speeds of 1/500th of a second. Although the images tended to be distorted at their outer ends, the PIs learned to cope with the camera's wide angle world view.

As with the KA-56 fitted in the RF-4C, the near-identical camera installed in the RF-101 had on board automatic processing of an ejectable film cassette that could be parachuted to ground commanders while the jet was travelling at speeds of up to 350 knots, thus allowing photo analysis to take place before the aircraft had returned to base. However, the quality of the imagery was inferior to the standard obtainable in the laboratory, which meant that in-flight processing was seldom used. Also, the film cassettes could easily land in the wrong place, making retrieval difficult and negating the advantage of rapid delivery.

Other modifications borrowed from the RF-4C included a camera photoflash detector, control set and data annotation system. Night reconnaissance capability was planned, using photoflash cartridges from a

RF-101C-60-MC 56-0053 in the distinctive colours of the 15th TRS 'Cotton Pickers', based at Kadena AB. Voodoos from this unit relieved the 45th TRS contingent at Don Muang in providing *Able Mable* missions from May 1962. Its aircraft had parts of their fuselages painted with corrosion-resisting grey paint prior to a full application of Aircraft Gray finish shortly afterwards (*Terry Panopalis Collection*)

centreline pod or a modified drop tank. Night operations were generally assigned to the RF-4C, and they yielded results. Dock workers in Haiphong harbour avoided US Navy daylight surveillance overflights by unloading visiting cargo ships at night, and their activities were recorded by a USAF photoflash-dispensing Phantom II on 28 February 1966.

By 1965 the RF-101C had become a highly capable reconnaissance platform with a spectacular performance, as Capt Paul Subbie recalled;

'The Voodoo had gobs of power on tap when you demanded it. Take-off was a thrill when the afterburners kicked in and initial climb could shoot you up at 45,000 ft per minute, and that's within the first minute of climb! The later versions [F/RF-101C] with the stronger wing had increased g tolerance from 6.3 g to 7.33 g – a definite advantage when trying to out-manoeuvre an SA-2 fired from below you. The service ceiling was around 51,000 ft, with a maximum operating altitude of about 53,000 ft.'

Gen Charles de Gaulle's decision in March 1966 to expel *all* USAF units from France (prompted partly by the accidental photographing of an unmarked French nuclear plant by 66th TRW RF-101C pilot Capt Joe Smith in April 1965) caused a hasty move by the 17th and 18th TRSs to RAF Upper Heyford, in Oxfordshire, from where they continued operations in support of USAFE until January 1970. The wing's 36 metallic silver RF-101Cs made the journey to Britain on 11 September 1966.

The RB-66-equipped 10th TRW at Alconbury had converted to the RF-4C in 1965, but 66th TRW units retained their Voodoos until 1970. The first squadron to switch to the photo-reconnaissance Phantom II at Upper Heyford was the 17th TRS, which commenced its transition in 1969. In 1970, when the F-111-equipped 20th TFW took over the base, the 17th TRS joined the 86th TFW at Zweibrücken, in West Germany, while the 18th TRS was transferred to the 363rd TFW at Shaw AFB and its Voodoos passed on to the Air National Guard (ANG) after the squadron began to receive RF-4Cs. The 66th TRW was deactivated on 1 April 1970.

At Phalsbourg-Bourscheid, the 32nd TRS had been transferred to the 26th TRW at nearby Toul-Rosières in October 1965, where it commenced conversion to the RF-4C, followed by the 38th TRS in January 1966. The latter unit, which had flown Voodoos from Toul-Rosières since October 1960, moved to Ramstein in October 1966.

RF-101C-65-MC 56-0068, in full 45th TRS 'Polka Dots' markings on bare metal surfaces, is seen heading a line-up of squadron aircraft during an exercise in the USA in the early 1960s. The Vietnam War made huge demands upon the reconnaissance community, extending the RF-101C's service life well beyond 1965, when its replacement by the RF-4C had originally been scheduled. Their nine years at war also left the combat-weary airframes with only around five years of useful ANG service before retirement (*USAF*)

CHAPTER THREE

VIETNAM – OPENING MOVES

In November 1964 the US government was faced with a deep dilemma over Vietnam. President Lyndon B Johnson and Defence Secretary Robert S McNamara received a report from the Vietnam Working Group, headed by Assistant Secretary of State William Bundy, warning that the continuation of a non-communist South Vietnam would depend on US military action to 'defeat North Vietnam and probably communist China'. Such a commitment 'would involve high risks of a major conflict in Asia that could not be confined to air and naval action but would almost inevitably involve a Korean-scale ground action and possible even the use of nuclear weapons'.

Anxious to avoid such a disastrous outcome, the Group suggested a negotiated settlement, or sharply increased conventional military pressure, or a combination of the two. The latter course was adopted and it shaped the US 'stop-start' policy towards North Vietnam for the following eight years. A further, apocryphal warning was the CIA's judgement that the nature of North Vietnam's decentralised, agriculture-based economy and the Hanoi leadership's belief that collapse of the South Vietnamese regime was imminent would render bombing ineffective as a means of altering North Vietnam's determination to await its chance of an invasion.

Frustrated by the complexities of the situation, but also unwilling to withdraw US forces from the country altogether, President Johnson approved a two-phase plan which began with armed reconnaissance

flights against Viet Cong infiltration routes into Laos, combined with reprisal strikes if US air bases in South Vietnam were attacked. Phase Two would be a sustained aerial campaign against North Vietnam to force the communists into a peace settlement that respected the sovereignty of South Vietnam.

By February 1965, provocative Viet Cong attacks on US facilities at Pleiku AB, near Saigon, made the use of escalating reprisal strikes politically inevitable. For USAF RF-101 pilots, this involved one of the most crucial missions of the war – finding the enemy and conveying that information to control centres for it to be converted into targets. The combat environment in which this task was to be performed could hardly have been more challenging.

The Voodoo was one of the first US jet aircraft to participate in the Vietnam War. RF-101As of the 17th TRS had visited the area in 1957-58, and Voodoos were intended to replace the RF-84F Thunderflashes of the 67th TRW's 15th TRS 'Cotton Pickers' at Kadena and the 45th TRS 'Polka Dots' at Misawa AB on the island of Honshu, Japan, whose aircraft began to arrive in mid-1958. A USAF comparative evaluation showed that the RF-101's superior speed and the versatility of its camera equipment gave it a major operational advantage over the RF-84F. Nevertheless, the Thunderflash had a useful camera suite and long range, and in late 1962 Thirteenth Air Force asked unsuccessfully for eight to supplement its limited RF-101C numbers. Requests for one or two additional RF-101Cs were also denied, as the other USAF commands hung on to their scarce Voodoos. It was not until 1 April 1963 that two more 45th TRS aircraft joined the Operation *Able Mable* team in Thailand, bringing its total strength to just six Voodoos.

From March 1960 the 15th TRS was attached to the 18th TFW, which was part of the 313th Air Division, while the 45th TRS was assigned to the 39th Air Division so that the 67th TRW could be deactivated that same year. Their vast operational area of interest covered Japan, Korea and Southeast Asia down as far as South Vietnam, so long high-altitude transit flights were commonplace. Fortunately, the Voodoo's cockpit was comfortable by fighter standards. Pilots sometimes photographed Soviet bombers, patrol aircraft and intelligence-gathering ships. Very precise navigation was required, assisted by TACAN, an ARA-25 direction finder and an AN/ASN-6 navigation computer, but dependent mainly on piloting skills. In-flight refuelling became essential for most missions, and RF-101Cs were well-equipped for that, having been designed at a time when the USAF was transitioning from drogue-trailing KB-50s and KC-97s to flying boom-equipped KC-135A Stratotankers. An extending

The 45th TRS decorated some of its aircraft with nicknames, and this habit would eventually become more prevalent during 1969. RF-101C-65-MC 56-0079 *MARY ANN BURNS* (inspired by a tribute song to a large lady with a reputation) was assigned to 1Lt Fred Muesegaes (squatting, front left), and it was among the first Voodoos to make an *Able Mable* deployment to Don Muang RTAFB near Bangkok in June 1960, as seen here. Maj Ken Habst and 1Lt Jack Weatherby (front row) are seen with Capt Ralph de Lucia, Capt Bill Whitten and 1Lt John Linihan (rear, from left to right). When the squadron's colourful markings were covered with camouflage paint, the pilots preserved them to a degree by wearing polka dot neckerchiefs and helmets or painting reduced versions on the fin caps of a few aircraft (*USAF*)

refuelling probe could plug into a drogue basket, or a receptacle mid-way along the top of the fuselage could accept a Stratotanker's boom.

The deployed Voodoos soon suffered from corrosion due to the salt-laden air around their coastal bases and extensive re-skinning was required, both at their airfields and during depot maintenance and modification at Hill AFB, Utah. Like other bare metal-finished aircraft of the time, they were eventually given a protective coat of Air Defense Command Aircraft Gray (FS 16473) paint, before eventually being camouflaged for Vietnam operations. Corrosion, particularly of magnesium components, would continue to plague RF-101Cs located in the humid climate of Thailand and South Vietnam. A new corrosion control facility had to be established at Kadena to tackle these problems as 15th and 45th TRS aircraft rotated through temporary deployments.

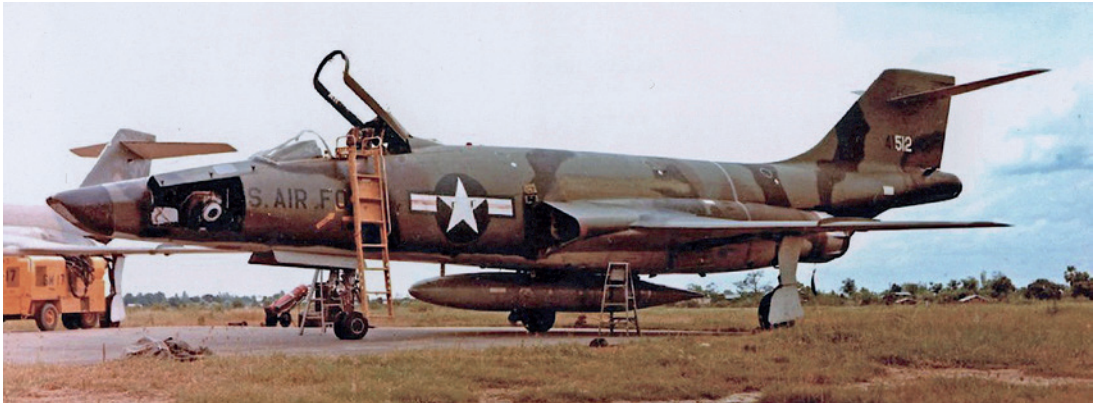
A tanker's-eye view of a bare metal RF-101C heading out on a mission over Laos in 1964. The RF-101C's productivity in Southeast Asia was out of all proportion to its numbers. At its peak in December 1966, the Voodoo force numbered only 29 aircraft, split between Tan Son Nhut and Don Muang, and this was reduced to 17 by January 1968 when they were operating only from the former base. RF-101s completed almost 14 years of operational service (*USAF*)

Weather was another enemy, but in the form of thick sea fog, tornados and tropical storms, rather than the standard European low visibility. RF-101s from the 'Cotton Pickers' had to seek alternative bases on several occasions due to typhoon warnings, and one aircraft was lost in heavy cloud when the squadron had to divert to Itazuke AB, Japan. Its pilot, Capt Lavender, ejected over the sea and was drowned when his parachute dragged him below the surface of the water.

INTO BATTLE

Increasing tensions in Southeast Asia generated a series of requests for reconnaissance detachments to operate from bases in Thailand and South Vietnam. Initially, the Geneva Conventions' ban on the use of US jet aircraft in South Vietnam had to be circumvented by training Vietnamese Air Force (VNAF) pilots to fly Lockheed RT-33 reconnaissance/trainers. Also, Project *Field Goal* (using camera-equipped ex-Philippines Air Force RT-33 53-5347 as a 'one-man reconnaissance wing') at Don Muang, Exercise *Air Bull* and Project *Pipe Stem* were short-term commitments leading to the creation of the *Able Mable* Task Force in 1961. Camera-equipped C-47B 44-76330 of the 315th Air Division also briefly operated out of Udorn RTAFB until it was shot down by Pathet Lao ground fire on 23 March 1961, killing seven of its eight crew (the sole survivor was held as a PoW for 17 months).

The overall aim of these reconnaissance missions was to monitor North Vietnamese military support for communist Pathet Lao forces that were preventing the establishment of a neutral, unified Laos. Four RF-101Cs visited Don Muang for two days in June 1960 to provide reconnaissance for the Thai government and three more deployed to Takhli RTAFB for the first nine days of March 1961 for Southeast Asia Treaty Organisation



RF-101As (including 54-1512 seen here) were among the first USAF aircraft to be given tactical camouflage in view of their low-altitude, terrain-hugging missions. Before a standard scheme to TO-1-1-4 was approved, several experimental patterns retaining the original national markings were used in 1964. Camouflage was suggested by pilots flying missions during the Cuban Missile Crisis, when experiments with various schemes began (*USAF*)

(SEATO) Exercise *Air Bull* without significant political fall-out over Geneva Conventions violations, so the plan to train VNAF reconnaissance pilots was quickly dropped.

The first longer-term detachment of four Voodoos to Don Muang was approved by the Thai government in October 1961, and on the 18th of that same month four RF-101Cs and six pilots from the 15th TRS arrived at Tan Son Nhut AB near Saigon, ostensibly for an airshow appearance. The shortage of ground-support facilities and fuel meant that KB-50 tankers had to be used to ground-refuel the Voodoos by attaching their in-flight refuelling baskets to the fighters' extended refuelling probes. Although the airshow never happened, the RF-101Cs stayed at the base as the *Pipe Stem* Task Force, with its own support personnel and photo processing cell (PPC) that would soon be flooded with miles of photographs whose main content was top-views of forest. Nevertheless, *Pipe Stem* Voodoos provided the USA with the first hard evidence in 1962 of North Vietnamese and Pathet Lao activity in northern Laos. The photographs, taken by Capt John Evans, were flown directly to the White House for analysis.

A rationale was devised for the Voodoos to stay in place for a month as the only jet reconnaissance force in the area. The Mekong River had burst its banks on the day the Voodoos arrived, making 320,000 people homeless and causing widespread damage, so the South Vietnamese government requested photo-reconnaissance of the affected areas. These flights commenced on 20 October, followed 24 hours later by the first *Pipe Stem* sorties. During the latter, Voodoos flew covert reconnaissance missions over the Plain of Jars, the Ho Chi Minh Trail and northern Laos, where Soviet supply aircraft and troops were photographed (with the RF-101C's 36-inch split vertical cameras) assisting the Pathet Lao and North Vietnamese forces. The photographs provided Washington with the first clear evidence of this intervention. The flights quickly began to attract ground fire as the RF-101C gradually entered into the conflict and the detachment required reinforcement.

Pipe Stem came to an end after 67 useful sorties that demonstrated the effectiveness of tactical reconnaissance by fast jets like the RF-101C. Officially, the International Control Commission (ICC) had allowed it into the area temporarily to photograph flood damage by the Mekong River, and when the floods abated the ICC (*text continues on page 46)*

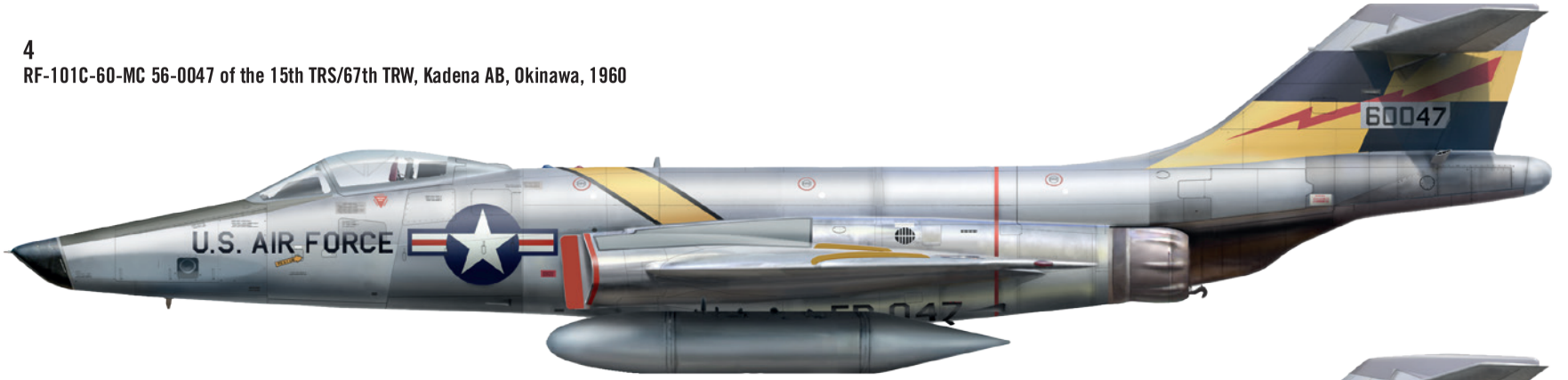
COLOUR PLATES

1
RF-101C-40-MC 56-0170 of the 363rd TRW, Operation *Blue Bat* Composite Air Strike Force, Incirlik AB, Turkey, August 1958

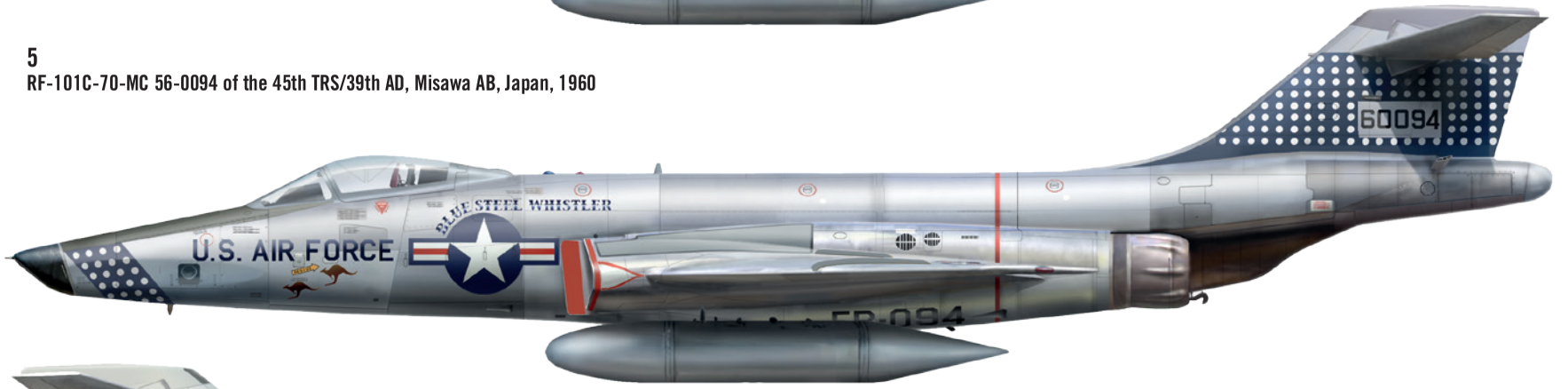
2
RF-101C-50-MC 56-0189 of the 29th TRS/363rd TRG, Shaw AFB, South Carolina

3
RF-101C-65-MC 56-0070 of the 32nd TRS/66th TRW, Phalsbourg-Bourscheid AB, France, May 1959

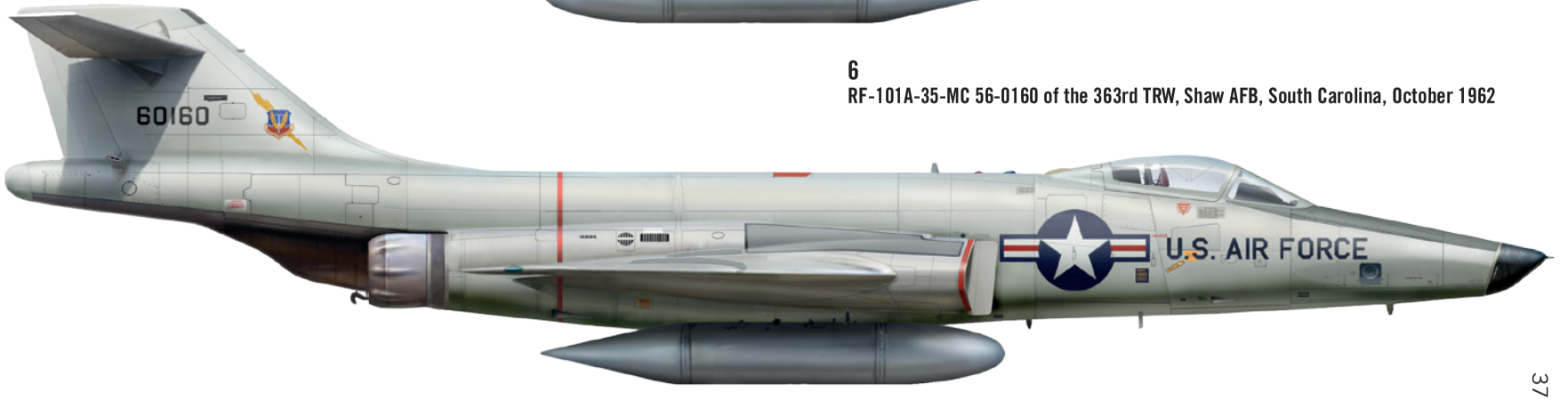
4
RF-101C-60-MC 56-0047 of the 15th TRS/67th TRW, Kadena AB, Okinawa, 1960

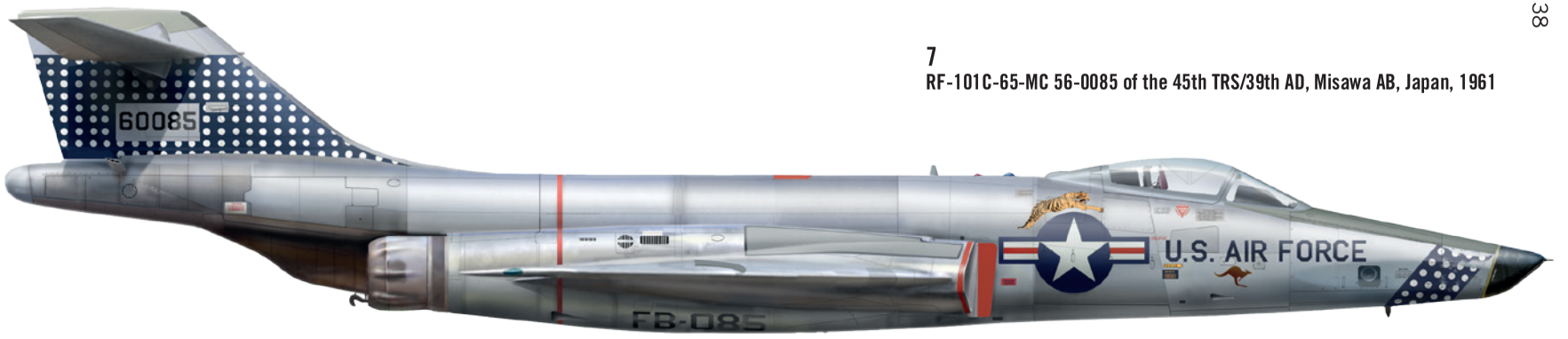


5
RF-101C-70-MC 56-0094 of the 45th TRS/39th AD, Misawa AB, Japan, 1960

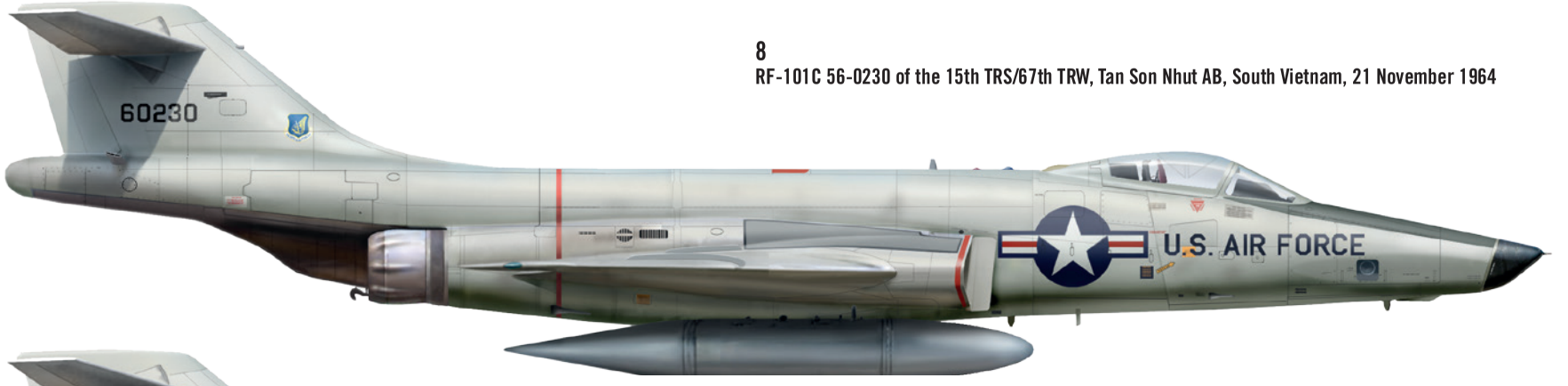


6
RF-101A-35-MC 56-0160 of the 363rd TRW, Shaw AFB, South Carolina, October 1962

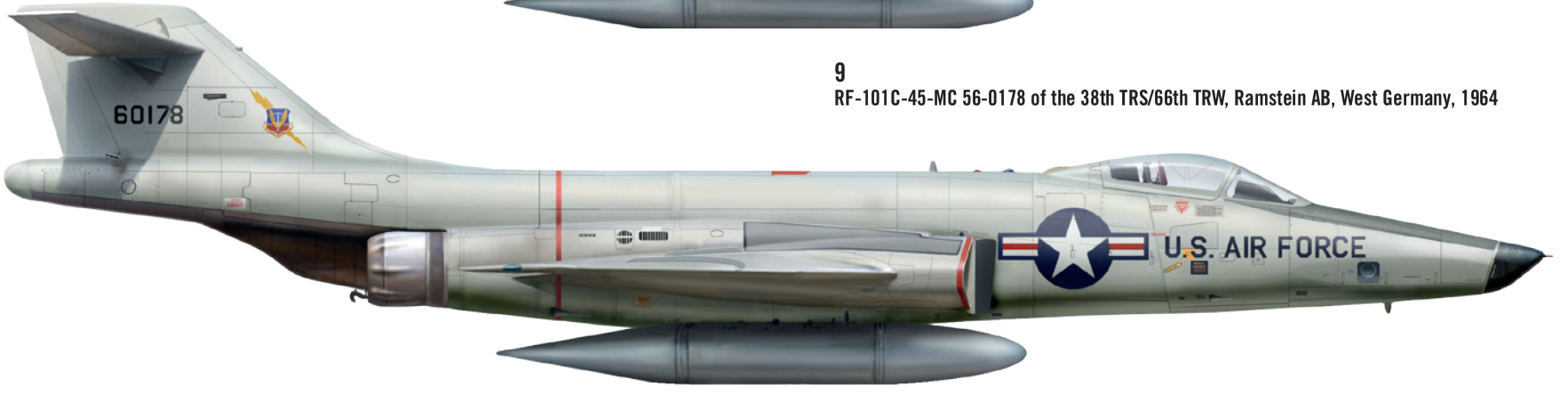




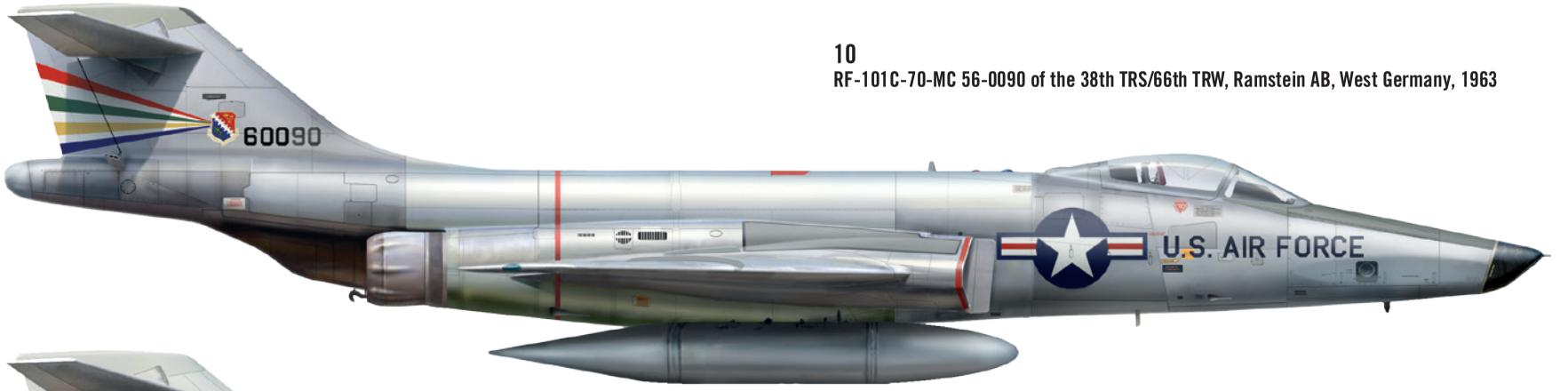
7
RF-101C-65-MC 56-0085 of the 45th TRS/39th AD, Misawa AB, Japan, 1961



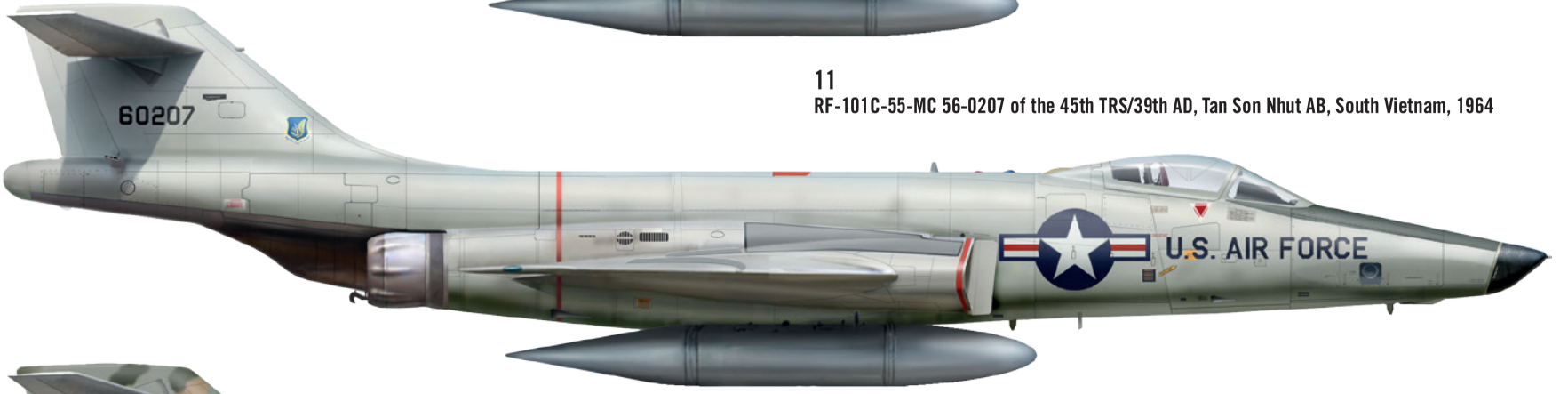
8
RF-101C 56-0230 of the 15th TRS/67th TRW, Tan Son Nhut AB, South Vietnam, 21 November 1964



9
RF-101C-45-MC 56-0178 of the 38th TRS/66th TRW, Ramstein AB, West Germany, 1964

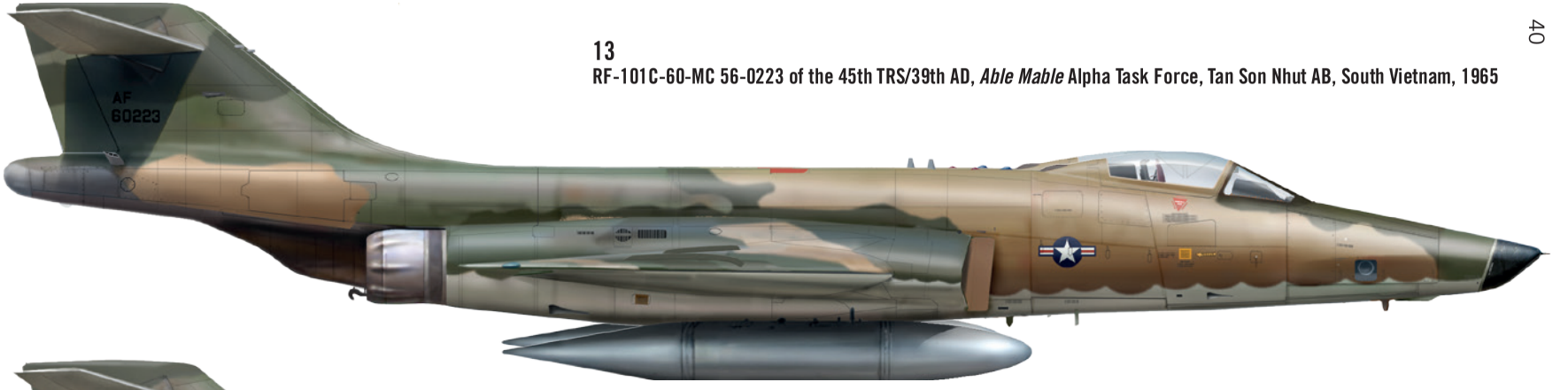


10
RF-101C-70-MC 56-0090 of the 38th TRS/66th TRW, Ramstein AB, West Germany, 1963

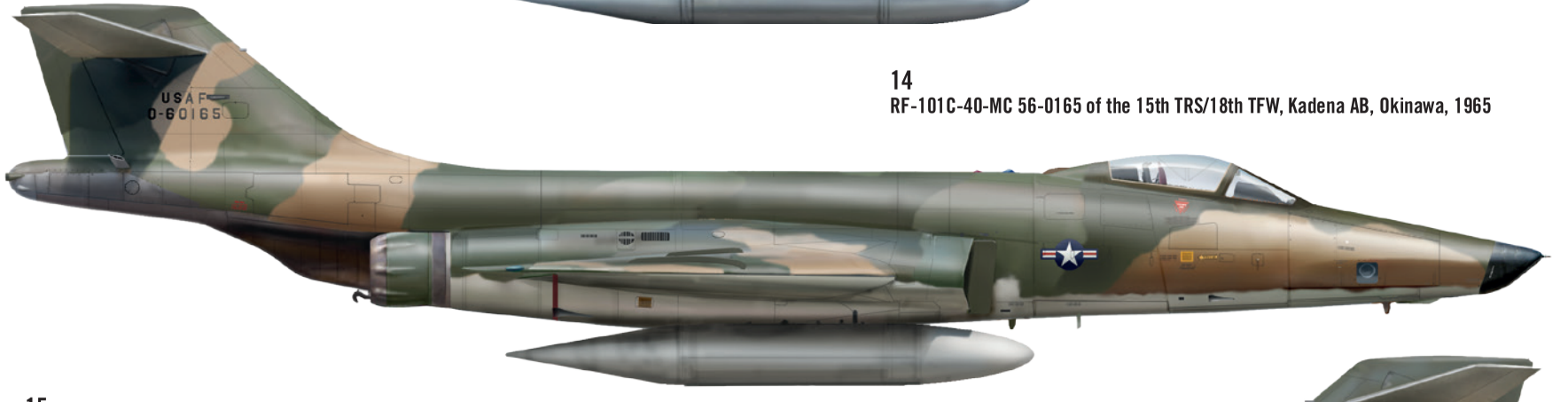


11
RF-101C-55-MC 56-0207 of the 45th TRS/39th AD, Tan Son Nhut AB, South Vietnam, 1964

12
RF-101A-30-MC 54-1514 of the 363rd TRW, Shaw AFB, South Carolina, 1964

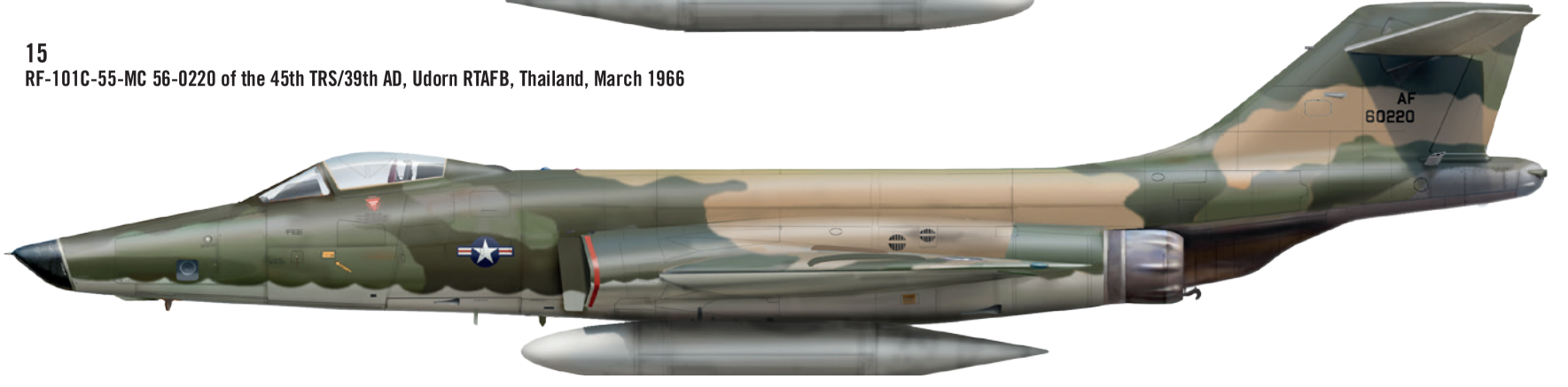


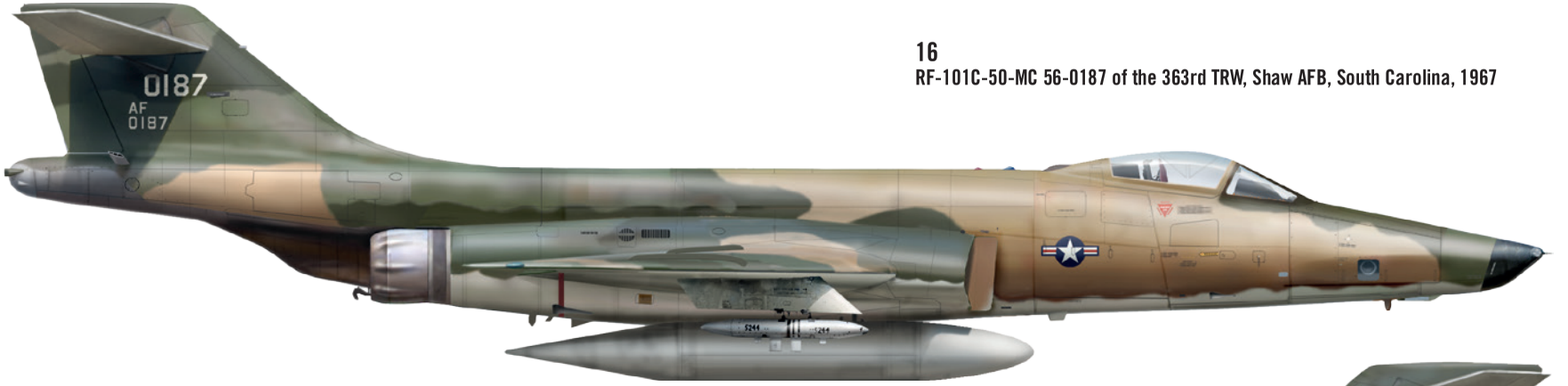
13
RF-101C-60-MC 56-0223 of the 45th TRS/39th AD, *Able Mable* Alpha Task Force, Tan Son Nhut AB, South Vietnam, 1965



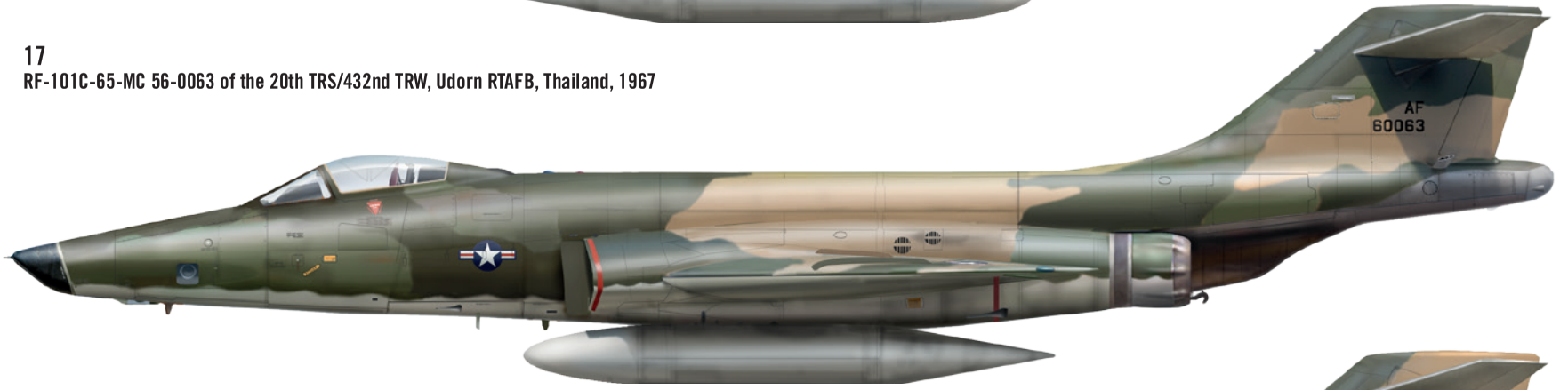
14
RF-101C-40-MC 56-0165 of the 15th TRS/18th TFW, Kadena AB, Okinawa, 1965

15
RF-101C-55-MC 56-0220 of the 45th TRS/39th AD, Udorn RTAFB, Thailand, March 1966





16
RF-101C-50-MC 56-0187 of the 363rd TRW, Shaw AFB, South Carolina, 1967

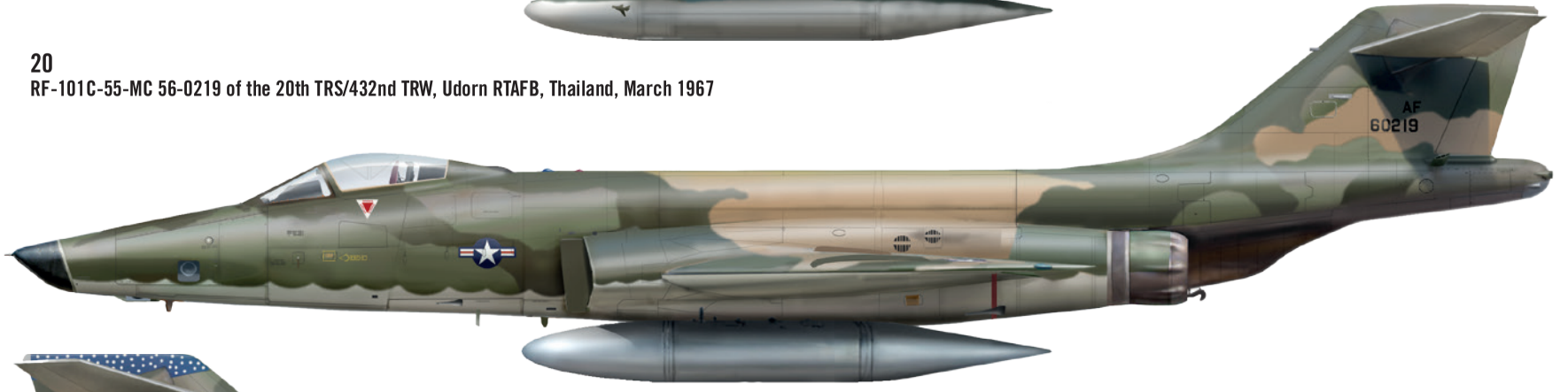


17
RF-101C-65-MC 56-0063 of the 20th TRS/432nd TRW, Udorn RTAFB, Thailand, 1967

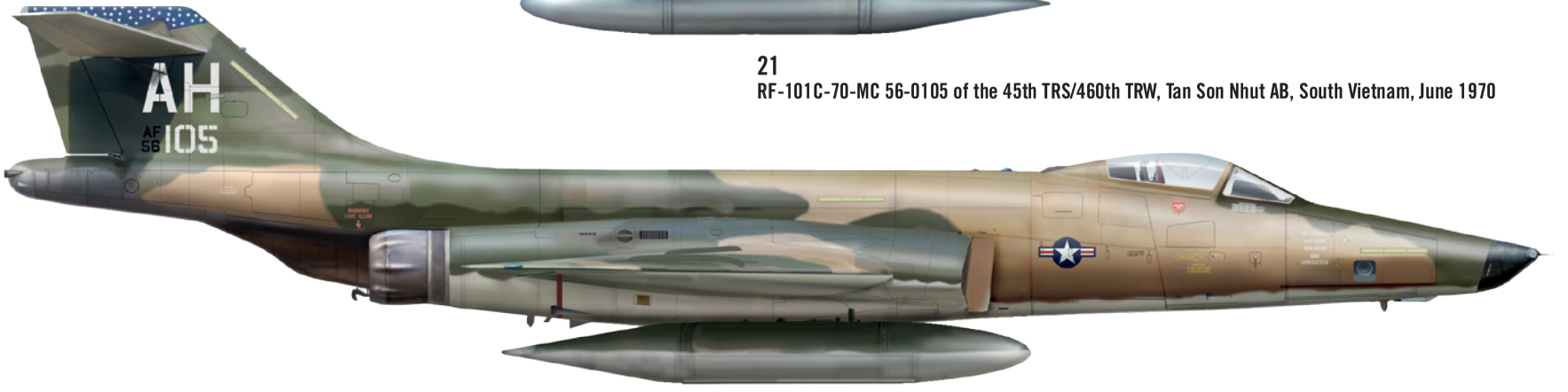
18
RF-101C-65-MC 56-0061 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, June 1968

19
RF-101C-65-MC 56-0068 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

20
RF-101C-55-MC 56-0219 of the 20th TRS/432nd TRW, Udorn RTAFB, Thailand, March 1967



21
RF-101C-70-MC 56-0105 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, June 1970



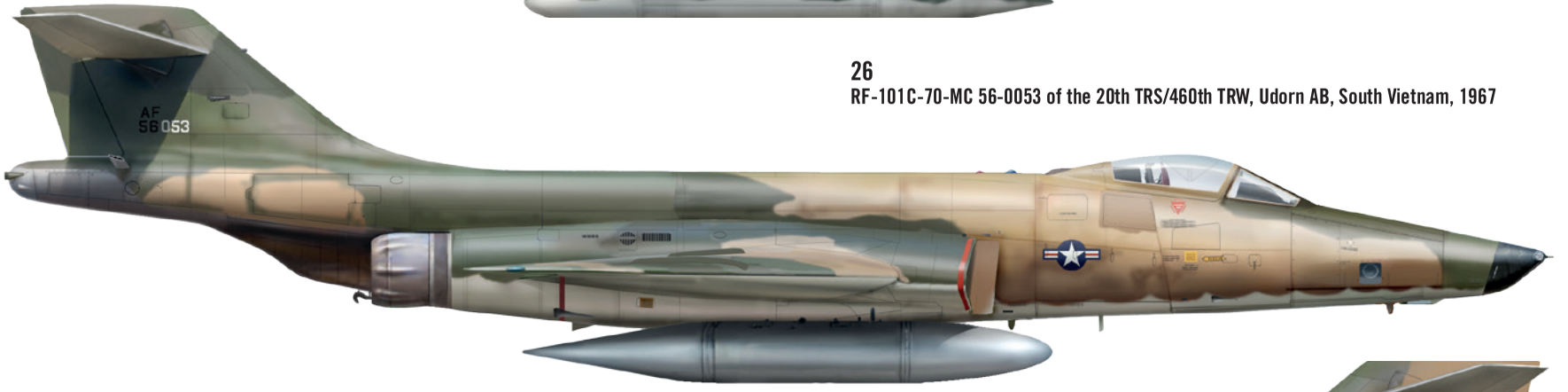
22
RF-101C-60-MC 56-0041 of the 45th TRS/460th TRW, Phu Cat AB, South Vietnam, 1969

23
RF-101C-75-MC 56-0119 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

24
RF-101C-45-MC 56-0176 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

25
RF-101C-40-MC 56-0166 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

26
RF-101C-70-MC 56-0053 of the 20th TRS/460th TRW, Udorn AB, South Vietnam, 1967



27
RF-101C-40-MC 56-0168 of the 45th TRS/460th TRW, Tan Son Nhut AB, 1969

28
RF-101A-35-MC 54-1519 ('5656') of the 4th CRS, Taoyuan AB, Taiwan, 1960

29
RF-101C-60-MC 56-0048 of the 31st TRTS/363rd TRW, Shaw AFB, South Carolina, August 1970

30
RF-101C-65-MC 56-0080 of the 29th TRS/363rd TRW, Shaw AFB, South Carolina, 1967

ordered the detachment back to Kadena on 21 November. Although the jets returned to Okinawa, the ground support equipment (some of it acquired from USAFE units) remained in place for an expanded *Able Mable* force, with Tan Son Nhut AB later established as Operating Location 2 for the RF-101C's activities.

On 7 November 1961 a 45-man detachment from the 45th TRS commanded by Maj Ken Harbst and including a PPC run by the 67th Reconnaissance Technical Squadron (RTS) took up residence at crowded Don Muang for Project *Able Mable* – a 30-day arrangement that would replace the RT-33 *Field Goal* effort which had ended in mid-May. The PPC was established in an abandoned barracks at the run-down base, water supplies for photo processing were arranged and two A9 processing machines were flown in, although they proved to be so troublesome when used that much of the vast film footage generated by the Voodoos initially had to be hand-processed. Humidity, poor-quality film emulsions and insect invasions all added to the daily workload. Doug Ayers, a 460th TRW film technician, recalled that these local processing problems persisted into the mid-1960s;

RF-101Cs received several initial camouflage schemes. This pattern of greens on 363rd TRW RF-101C-40-MC 56-0166 retains the previous national markings and under-fuselage 'buzz' numbers, and displays one of many variations on serial number presentation. Repainted in standard camouflage, this former *Sun-Run* competitor flew combat with the 45th TRS as *LUV BUG!* Note the partially camouflaged drop tanks attached to the underside of the jet (*Terry Panopalis Collection*)

'Film damage often happened due to power loss because the diesel fuel was of poor quality and the plumbing lines would get clogged because of a build-up of silver [photographic residue] in them. I figured that this [residue] could exceed 20,000 ounces per month, but I'm not sure if that included the 40,000 lbs [of film stock] a month that was burned as scrap, including about 120 ounces of silver per 1000 lbs of film.'

All the pilots had considerable experience of the Voodoo, most of them having flown it in USAFE. Very different tactics would be needed in Southeast Asia, however. Their medium-altitude RF-101C flights – usually up to three per day – covered the Laotian and South Vietnamese Ho Chi Minh Trail supply routes to Viet Cong insurgents at a tactical radius of up to 500 miles from Don Muang. They were met by truck-mounted quad 0.50-cal or 23 mm automatic fire and accurate, heavy AAA in a few areas such as Tchepone at altitudes up to 40,000 ft. Maj Herbst's aircraft was hit over South Vietnam, knocking out an engine and wounding the pilot, although he managed to land at Don Muang.

Mission planning was a late-afternoon routine based on orders received from PACAF HQ and requiring the selection of several targets for each RF-101C sortie. Pilots were supposed to perform their missions at 40,000 ft to disguise their presence over a supposedly neutral country, although many flights took place at lower levels, particularly when the unpredictable weather ruled out the use of high-altitude cameras. Lower flights attracted small-arms fire, and several aircraft returned with bullet holes after making photo passes below 1500 ft, prompting a short-lived instruction to use minimum altitudes above 5000 ft. Choke point areas on the trails network were most likely to have AAA defences. In the summer of 1961 Voodoos photographed 23 Soviet-built PT-76 amphibious light tanks moving on the supposedly neutral Plain of Jars.

Most missions were flown over Laos but an increasing number covered targets in northern South Vietnam and (occasionally) Cambodia in a covert programme called *French Leave*, which often forced pilots at the full extent of their range to divert to Tan Son Nhut for refuelling and processing of their film.

As the Viet Cong insurgency increased throughout 1961, so demands on the *Able Mable* crews also grew and their 30-day stay was extended, rotating pilots and aircraft at six-week intervals. The combat experience gained at this time by 45th TRS pilots, who were flying up to 20 sorties each during a typical deployment, was invaluable for their widening role in the war. By the time *Able Mable* over Laos came to an end in December 1962 (much to the displeasure of the USAF) in order to comply with neutrality agreements, the RF-101Cs had flown 720 missions over Laos and South Vietnam. However, President Kennedy subsequently sanctioned further *Able Mable* flights over South Vietnam.

SHUTTER TACTICS

When planning a mission, altitude and speed had to be carefully calculated for the type of camera being used so that photographs would be produced to a pre-determined scale. An altitude of 2000 ft with 6-inch cameras, for example, would produce images at 1:4000 scale. For 'mosaic' coverage of a set area, requiring a series of overlapping images, the aircraft would make a number of parallel runs with the cameras set to give a 60 per cent overlap from the forward-looking cameras and 40 per cent for the side-view installations. In the laboratory the prints could then be laid out so that they joined up to make a mosaic overview.

In planning his flight, the pilot selected start and finish points on the grid lines of a map for his first run, or 'line'. At the end he would turn and come in again from around eight to ten miles from the second start point, setting the autopilot to maintain altitude for the next run. An optical view finder allowed the pilot to look down and identify his start point on the terrain. A grid display on the view finder could be adjusted to allow for wind drift and enable the pilot to keep to a straight line as he activated his cameras. On two-aircraft missions, a wider area could be photographed in each pass, thus giving the photo-interpreters more footage to help them identify small targets such as vehicles, arms caches or supply dumps. In areas of dense jungle, it was difficult to identify small targets in advance so the blanket 'area cover' approach was inevitable.

During 1961 RF-101C pilots brought back over 50,000 ft of exposed film for analysis, using only four aircraft in all. The normal practice was to process film from all the aircraft's camera position in one session so that the sortie could be examined as a complete unit of data.

Because there were few precise targets to look for, pilots tended to keep the cameras running in the hope that the PIs would be able to spot something of interest. Usually, there was little to see, and PIs became more selective in examining the film on light-tables. If two RF-101Cs had flown a mission as a pair, the second aircraft's film might be ignored unless there was something unusual on the lead Voodoo's film. Vast quantities of exposed negative film went to the bonfires outside the processing cell,

Camouflage was applied to RF-101C-75-MC 56-0125 of the 66th TRW, this scheme being one of several versions of the standard TO-1-1-4 pattern increasingly seen on Voodoos from the mid-1960s. This aircraft later flew with the 363rd TRW at Shaw AFB and then the Kentucky ANG, before being preserved at the Aviation Museum of Kentucky at Blue Grass Airport in Lexington. It has Project 1181 modifications, including the extra KA-56 panoramic camera beneath the nose. The access door for this camera is open in the photograph (*USAF*)

or after examination at Yokota and possible printing of stereo images of any interesting shots.

On one notable occasion a Voodoo's cameras caught Burmese air force Hawker Sea Furies attacking a Chinese drug-dealer's 'empire' near the Chinese border, but endless images of trees, small footpaths, clouds or isolated settlements comprised most of the PIs' daily viewing during headache-inducing, 12-hour day and night shifts. However, due to the complex chain of command and delivery procedures, ground commanders often objected to delays of up to 48 hours in receiving photos of potential targets.

Missions into Laos tended to use the same five routes and timings during regular two-hour slots each day. Like the North Vietnamese during Operations *Rolling Thunder* and *Linebacker II*, the communist Laotian forces were therefore able to anticipate the Voodoos' photo-passes, prepare their anti-aircraft defences and attempt to disguise any military targets. Times and routes were varied towards the end of 1961 for that reason, and two-aircraft missions were flown whenever possible to cover for faulty cameras in one jet and to provide information if an RF-101 was shot down in an area where communications were difficult and Voodoos could simply disappear into the jungle.

A 1966 analysis of losses showed that several had occurred to wingmen in two-ship flights as AAA gunners who allowed insufficient 'lead' in aiming their fire routinely hit the second aircraft rather than the leader who was their intended target. Single-aircraft sorties were preferred as a result, and pilots quickly learned to maintain speed but vary their heading and altitude as much as possible, except when actually making a photo run. For single aircraft, the freedom to use a pilot's individual skills to manoeuvre and use the terrain for disguise without regard for a wingman appealed to some pilots, while others valued the second pair of eyes, particularly when the threat environment became much more challenging later in the war. Crucially, a quick exit increased the chances of survival, and repeat runs had to be avoided.

As enemy defences increased, the temptation to seek targets of opportunity was discouraged. Most sorties, in any case, revealed unexpected sights, ranging from camouflaged arms dumps to the shell-bursts from unseen AAA firing beneath the Voodoo. If they were shot down, pilots were aware that their 1950s-era high visibility orange flightsuits reduced their chances of escape from the murderous Pathet Lao, and a gradual transition to green suits occurred in 1964.

The reconnaissance community was still quite small and close knit in the mid-1960s, and pilots were very experienced specialists who liked to have a principal role in planning their missions. Close supervision from distant higher authority – an increasing burden as the war developed – was unwelcome and often counterproductive. Lack of accurate mapping of much of Southeast Asia was a constant handicap to air operations early in the war, and Voodoo pilots usually had to rely on old French touring maps to avoid terrain whose contours were often incorrectly stated on other maps and to navigate tracts of land that appeared on no other maps.

The monsoon brought big changes to the outlines of rivers and lakes, and much of the karst terrain was shown on maps with inaccurate estimates of the heights of mountains – a major hazard for pilots flying at night, in heavy overcast or in the smoke caused by the local practice of burning field vegetation. Coverage of North Vietnam was particularly incorrect, and it took a major photo-mapping operation by US Navy RA-5C Vigilantes in 1965 to correct that deficiency.

In 1962 the *Able Mable* detachment was asked to map part of the region using Fairchild T-11 mapping cameras with 6-inch lenses and stabilised mounts in place of their big KA-2s. After some strenuous debate between various branches of USAF HQ staff, it was decided that mapping was not a legitimate part of intelligence gathering and the RF-101C was not ideal for the task. The job was later passed to Tan Son Nhut's RF-4C unit, which charted inadequately mapped areas using the aircraft's long-range navigation (LORAN) system to establish checkpoints that could then be related to photo-mosaics by aeronautical cartographers. Although the Phantom II had a shorter unrefuelled range than the RF-101C, it had a much more sophisticated radar than the early-1950s type installed in the Voodoo. There was also pressure to equip some of the Voodoos with the KA-18A strip camera that had been trialled during the Cuba crisis, but it proved to be unsuitable for missions over the combat zone. A 10-184 strip camera with an optional stereo lens arrangement could be fitted in place of KS-72 cameras.

RF-101C-75-MC 56-0135 in a version of the 'Vietnam' camouflage scheme with other 66th TRW aircraft in silver finish at Ramstein AB, West Germany, in May 1966. Following subsequent service with the 29th TRS/363rd TRW and the Kentucky ANG's 165th TRS, this aircraft was initially put on display at Bergstrom AFB, Texas, prior to being moved to Maxwell AFB, Alabama (*Terry Panopalis Collection*)

By mid-1962 it was clear that the small *Able Mable* detachment was producing some valuable data on the expanding communist insurgency in the area, and a long-term plan evolved in which the 15th and 45th TRSs would alternate in providing six-month detachments of four Voodoos for the task force from their combined total of 32 aircraft. On 9 May 1962 the *Able Mable* aircraft were incorporated into Joint Task Force 116, which was a coordinated effort to defend Laos. As the volume of traffic hauling supplies to the insurgents increased, RF-101Cs brought back visual proof of hundreds of trucks, tanks and Soviet supply aircraft operating near the North Vietnamese border.

It was also clear that permission for the flights from the Royal Laotian Government could be withdrawn with little warning. There were always fears that the sorties over neutral territory might be exposed, possibly by North Vietnamese radar supposedly situated near Vinh, and in September 1962 President Kennedy halted *Able Mable* until he was reassured that secrecy could be maintained. As part of this reassurance, the USAF promised that pilots flying over Laos would remain south of Cambodia when en route to their objectives. Throughout the latter part of 1962 the rules of engagement (RoE) on routes, minimum altitudes and permitted overflight areas were changed almost weekly – an aspect of the war that would become all too familiar to USAF aircrew.

On 14 August, after several aircraft had been damaged by ground fire, a Voodoo flying over Route 7 on the Plain of Jars was hit by an AAA shell that exploded under the cockpit, damaging the right engine, cutting hydraulic and electrical lines and jamming the nose gear. Capt Tom O'Meara managed to nurse the crippled aircraft back to Don Muang and land with a collapsed nose gear, blocking the runway for two hours. Unfortunately for US diplomacy, the AAA had blown off one of the aircraft's forward maintenance access doors, which was found and used by the Pathet Lao to publicise that US aircraft were operating over Laos. *Able Mable* flights were duly suspended for two weeks. When they resumed, a minimum altitude of 35,000 ft was imposed, which made much of the imagery too small to be useful. Even a 10,000-ft minimum altitude reduced the amount of detail visible in a forested scenario. Pilots were also restricted to the southern part of Laos, where trails traffic was far less evident. The very small numbers of RF-101Cs allocated (each mission required a lengthy request and approval process) to *Able Mable* inevitably increased their workload.

Pathet Lao fighters soon realised that they could avoid detection by moving at night or under cover of the frequently poor weather, as did the increasing number of North Vietnamese drivers heading down the trails network into South Vietnam via Laos and Cambodia. Until the arrival of RF-4Cs in-theatre, there were no effective night photography aircraft available to PACAF. In an attempt to solve this problem four RF-101Cs were modified into *Toy Tiger* night photography configuration. This saw the fitment of Doppler navigation systems and the

The rotating prism installation for an RF-101C's tri-metragon horizon-to-horizon KA-56 camera is checked by Capt Ed Greer before flight. The RF-101's cameras were designed to record far more visible, obvious targets than the transient, jungle-camouflaged objectives of Southeast Asia. The Voodoo lacked the infra-red detection capability of later reconnaissance types, although this technology actually yielded disappointing results during the war. Infra-red cameras were tested in RF-101C 56-0168 at Shaw AFB, but they were included in the RF-4C's camera fit instead. Infra-red capability would have been useful in detecting vehicles on the well-camouflaged Laotian trails. In 1965 Voodoo pilots often saw long convoys waiting on the North Vietnamese side of the border, although they were forbidden from penetrating communist airspace in order to photograph them (*USAF*)

Technicians work on the forward-oblique 'dicing' camera installation. An AN/APN-22 receiver-transmitter antenna was located behind the camera position. The camera installations were easily accessible on the ground for maintenance and generally performed reliably in the demanding combat environment to which they were subjected daily (*USAF*)

installation of M-123 photoflash cartridge ejectors into the right drop tank. The jets were tested at Kadena AB in May 1962, with several operational missions subsequently being flown from Don Muang in July.

As previously noted, the *Toy Tiger* aircraft were transferred to the USA in November 1962 for potential use over Cuba. On their return to Don Muang after the emergency had ended, three *Toy Tiger* RF-101Cs made flights over the Mekong Delta which revealed that the external M-123 photoflash cartridges lacked enough power to produce clear night photographs, particularly over light-absorbent jungle terrain. Also, the smaller images produced by the K-45 (half the linear dimensions of a 9-inch x 9-inch negative from a KA-2) caused handling problems at the PPC, while pilots found the complex 'switchology' required to operate the night camera fit increased the cockpit workload unacceptably under combat conditions. Flying at relatively slow speed on autopilot at around 2000 ft while repeatedly ejecting photoflash cartridges also made the RF-101C extremely vulnerable to ground fire. They ignited two seconds behind the aircraft, reducing their illumination of the target area and distracting the pilot with their brilliance.

The night reconnaissance mission passed to a detachment of two black-painted RB-57Es, operating from January 1963 under the *Patricia Lynn* code name from Tan Son Nhut – these aircraft also offered some infra-red imaging capability. Like the RB-66s, the RB-57s could provide limited night reconnaissance capability with flares and infra-red detectors, but the results were minimal and daylight photography by Voodoos continued to provide the best evidence of enemy activity. Two more RF-101Cs were also added at that point, and a VNAF reconnaissance squadron was established at Tan Son Nhut with North American T-28 Trojans. Shortages of trained pilots forced its closure in May 1964, however.

October 1962 brought a request from the commander of PACAF, Gen Emmett E 'Rosie' O'Donnell, for photographic evidence that the North Vietnamese Army (NVA) was violating the DMZ between North and South Vietnam by routing supply convoys through the area. Three photo runs at various altitudes were required, with the aircraft staging through Tan Son Nhut AB and avoiding any overflight of Laos – USAF jets were barred from the country's airspace until May 1964.

The temporary use of the VNAF base underlined the practicality of operating a reconnaissance detachment from Tan Son Nhut rather than negotiating routes around the borders of 'forbidden' Laos from Don Muang. It also reflected the rapidly increasing Viet Cong activity in South Vietnam. Permission was given for *Able Mable* to move there as Advanced Echelon 2, drawing on personnel from the 67th RTS and establishing the 13th RTS at Tan Son Nhut in April 1963. The six RF-101Cs and 200 men of the 15th TRS, commanded by Maj Alexander Butterfield, took over from the 45th TRS at the base on 1 May. By the following month these Voodoos, together with four piston-engined RB-26s, were providing nearly three-quarters of the targeting imagery for air strikes in South Vietnam. Their photography also showed potential locations for

the 'strategic hamlets' that were being established to try and protect South Vietnamese villagers from the widespread Viet Cong insurgency.

The 45th TRS detachment returned to Tan Son Nhut at the beginning of November, and stayed in-theatre until May 1964. For Voodoo pilots, the move from Don Muang to Tan Son Nhut shortened average mission distances by up to a half, although coping with the hazards of overcrowded approach routes and sometimes eccentric air-traffic control made flying from the VNAF base challenging. This change in airfields also meant that the RF-101Cs now had sufficient unrefuelled range to fly along the Cambodian border and use a KA-1 camera to regularly photograph supply routes that ran through that country without violating its neutrality, although it was clear that significant Viet Cong and NVA activity was occurring in Cambodia.

The *Able Mable* Task Force was absorbed into Tan Son Nhut's 33rd Tactical Group on 8 July 1963, thus removing its autonomy as a reconnaissance unit, although its name was still used. Tan Son Nhut's PPC was able to process some of the film generated by RF-101Cs on short-term assignments to Don Muang in mid-1963, and by the end of that year it was beginning to receive more acceptable night photography results as tactics and modifications to equipment brought improvements. As 1963 drew to a close, Voodoos were usually flying up to five sorties each per day, and also supplying an 'alert' aircraft to cover targets that appeared at short notice.

A four-aircraft detachment from the 15th TRS was sent to Don Muang on 20 April 1964 as Reconnaissance Task Force (RTF) Bravo to participate in SEATO Exercise *Air Boon Choo*. Thirty-six sorties were duly flown before the RTF moved back to Tan Son Nhut. Here, it accepted two additional aircraft prior to relieving the 45th TRS detachment and forming a new *Able Mable* Task Force.

The workload increased further from 17 May 1964 when flights over Laos were once again requested for coverage of the new conflict between government troops and the Pathet Lao on the Plain of Jars. Rather than direct military intervention to support the Laotian government, the White House promoted regular reconnaissance flights over the area. RF-101C flights over the Laotian panhandle began again on 19 May 1964. Newly established Pathet Lao military sites such as the camp at Ban Thay were also photographed. Reconnaissance aircraft could now roam over most of Laos, although North Vietnam was still forbidden territory.

To handle the increased burden, the task force's complement of RF-101Cs had been increased to ten on 30 April 1964. The *Able Mable* name was also reinstated at this time.

Three of the aircraft at Tan Son Nhut had KA-45 cameras installed in place of their KA-2s for high-speed, low-altitude 'dicing' sorties. Most missions actually required the Voodoos to fly at medium altitudes of around 10,000 ft, despite their vertical cameras having difficulty in detecting enemy activity or materiel that was camouflaged from such heights. At lower, but riskier altitudes within the AAA envelope, the forward- and side-facing cameras could see under camouflage netting or foliage.

For the personnel working on the RF-101Cs' camera systems, the build-up of a reconnaissance force overseas often meant frequent reassignments. Sam Stimson was a '40250' technician on RF-101Cs from 1960 to 1966;

'I was stationed in France and at Shaw AFB, Tan Son Nhut AB and Udorn RTAFB. In 1965, during the war, I went TDY [Temporary Duty] with a small group of RF-101Cs from Shaw that had the new high-speed Chicago Aerial 4 x 4 cameras installed. We had a brief stop at Kadena and then on to Tan Son Nhut for three months. Then I returned to Shaw for a couple of months, before going on the road again with a squadron of our aircraft to Udorn to provide relief and strengthen the 20th TRS. We were housed in huts on stilts and had our own all-ranks club called the "Voodoo Lounge". We then received orders to move the 20th TRS to Tan Son Nhut. I was there until June 1966, when I was posted back to France – just in time to head off for RAF Upper Heyford when France departed from NATO. It was at this point that the RF-101C was replaced by the RF-4C.'

Additional support was provided by US Navy RF-8A Crusaders of VFP-63 that had been temporarily detached from USS *Kitty Hawk* (CVA-63), USS *Hancock* (CVA-19) and USS *Bon Homme Richard* (CVA-31), operating in the Gulf of Tonkin, and also from US Marine Corps unit VMCJ-1. The Crusaders' overflights of Laos – codenamed *Yankee Team* – from 19 May 1964 were supervised directly and minutely by the Joint Chiefs of Staff, rather than by local air commanders. The choice of cameras, the type of aircraft and mission details were all controlled by Washington to avoid offending the ICC, which monitored the terms of Laotian neutrality under the Geneva Conventions.

Like the RF-101C pilots, the Naval Aviators used high speed as their only defence. Nevertheless, an RF-8A on a mission with RF-101Cs was severely damaged by AAA on 21 May, and two were shot down by AAA over the Plain of Jars. Lt Charles Klusmann was hit by AAA on 6 June and became the first pilot to eject from a Crusader during a combat mission. Kept captive by the Pathet Lao for three months, Klusmann eventually escaped. His aircraft (from VFP-63 Det C, embarked in CVA-63) was the first of 20 RF-8 losses during the conflict in Southeast Asia. An F-8D flown by Cdr Doyle Lynn, CO of VF-111 (also flying from CVA-63), was shot down the following day while escorting another RF-8A – Lynn was rescued by an Air America (CIA) UH-34 helicopter.

In direct response to these losses, F-100Ds from the 510th TFS/3rd TFW gave the aircraft its combat debut on 9 June when they attacked AAA positions on the Plain of Jars with 750-lb bombs and 2.75-in. rockets. Eight Super Sabres from the squadron had been deployed to the VNAF's Da Nang AB to provide escort duties for the RF-101Cs. A Voodoo from Tan Son Nhut, from where *Yankee Team* missions had begun on 19 May, provided damage assessment of the well-disguised gun positions, and for the rest of the month the three RF-101C missions flown in this area each had an escorting flight of four F-100Ds. The Super Sabre escorts attacked an AAA position in the Laotian panhandle region on 31 July 1964 after their RF-101C charge was hit by ground fire. During many of the missions flown in the heavily defended Mu Gia Pass section of the trails network in Laos, the escorting F-100Ds or F-105D Thunderchiefs would dive to very low altitude for high-speed bombing and strafing passes against AAA positions while the RF-101C pilots made their photo runs at 10,000 ft. There was also an increase in the search and rescue (SAR) provision for the area in anticipation of more shoot-downs of reconnaissance aircraft.

Escort for RF-101Cs continued, with F-105s and F-4s progressively replacing the Super Sabres. However, no matter what fighter was tasked with protecting the Voodoo, the McDonnell jet would usually outpace its escort at low altitudes as the accompanying Super Sabres, Thunderchiefs and Phantom IIs had to carry external ordnance to attack ground defences that threatened the mission, thus reducing their speed and range. The RF-101C was capable of higher sustained speeds than the F-4 and F-105 due to its greater internal fuel capacity, and it also had better acceleration. Although the Voodoo was officially limited to 600 knots at low altitude, pilots regularly exceeded that figure. As enemy defences were increased, the regular RF-101C damage-assessment missions became more dangerous. Capt Paul Subbie recalled;

'It was the post-strike missions that presented the most danger because the enemy knew you were going to be back for more photographs to use for battle damage assessment (BDA). On these missions you were not only more vulnerable to attack, you were also a predictable target. Usually, the cameras were switched on just before the target, and were kept running after it to capture any additional targets in the immediate area.'

U-2 reconnaissance flights over the whole area began in February 1964, and a 7 August mission revealed that the first deliveries of MiG-17 'Fresco-As' to the 921st Fighter Regiment of the Vietnamese Peoples' Air Force (VPAF) at Noi Bai airfield, North Vietnam, had been made the previous day. From then on the reconnaissance escort fighters were armed with air-to-air missiles, as well as cannon armament and ordnance to attack AAA sites. F-100, F-105 and F-4 pilots were also authorised to pursue and attack any MiGs that threatened RF-101Cs.

Permission to fly over Laos was frequently withdrawn, but renewed when Pathet Lao activity increased. During 1964, pilots reported far more transport movement on the trails network and an increasing number of AAA weapons, some of them 57 mm guns with Soviet radar control, being fielded to protect the routes south. The NVA had begun to receive 12.7 mm and 0.50-cal weapons towards the end of 1963, and limited numbers of larger 37 mm and 40 mm guns were reported in mid-1964, with massive increases in the provision of these weapons throughout the rest of that year. By 1970 more than 700 AAA sites were in place on the trails, some positioned on high ground to shoot down at low-flyers.

Machine gun posts were set up above narrow valleys and gorges to fire down upon the fleeting jets, while steel cable 'spider webs' were strung across valleys to trap the aircraft, or at least force them higher where radar could pick them up. Infantrymen were trained to lie on their backs and fire a vertical curtain of bullets in front of approaching aircraft at low altitude. No amount of extra airspeed could protect a Voodoo against random bullets fired in that way, although strike-fighter escorts could act as a deterrent. AAA damaged an RF-101C on 31 July 1964 and attracted a punitive response from the fighter escorts.

In order to increase the number of planned reconnaissance flights, 2nd Air Division HQ sent a high-altitude weather-check RF-101C over Laos each day from 1 August, using the Voodoo pilots' superior knowledge of the subtleties of weather conditions. Many sorties had to be cancelled due to bad weather, particularly in the monsoon season, which caused

Before USAF tankers were available to support the early reconnaissance flights over Laos in 1965, the US Navy provided 'buddy' tanking facilities, in this case an A-4C Skyhawk from VA-113 embarked in USS *Kitty Hawk* (CVA-63). The RF-101C's dual probe or flying boom refuelling systems allowed this useful flexibility (*Terry Panopalis Collection*)

delayed take-offs, difficult in-flight refuelling and a frequent need to abandon principal targets and seek alternatives, or just simply abort the mission. Good information on weather was therefore one of the primary considerations when planning missions, as no US tactical aircraft were realistically 'all weather' types until the US Navy's A-6 Intruder and the USAF's F-111A became available. When the bombing of North Vietnam commenced in March 1965, the judgement of RF-101C or F-104C 'weather scout' pilots over planned target areas was often the crucial factor in deciding whether or not a mission should proceed.

From 29 May 1965 the US Navy also brought the useful innovation of in-flight refuelling to the *Able Mable* operation to save RF-101C pilots from having to stop and refuel at Da Nang AB. With both probe and flying boom refuelling capability, the Voodoo could take fuel from the trailing basket of KA-3B or A-4C/E tanker aircraft (enabling pilots to reach into northern Laos) until the USAF could provide its own KB-50 tankers.

The small number of RF-101Cs in-theatre proved increasingly valuable, and by the beginning of 1965 they had completed 2081 sorties. Gen William Westmoreland, head of Military Assistance Command, Vietnam (MACV), had ambitious plans to increase the US presence in Southeast Asia based on complex mathematical forecasts and assumptions. It was deemed by PACAF that at least twelve RF-101Cs and nine RF-4Cs, flying from two bases, and a major upgrade to the equipment of the 13th RTS at Tan Son Nhut would be needed to support Westmoreland's plans. The 13th's equipment was housed in primitive buildings and trailers, where faulty air conditioning and an unreliable electrical supply reduced the quality of the photo processing. Sometimes, processing staff had to lay plastic bags full of ice in the developing and fixing solutions to make them work at the right temperatures, and yet by January 1966 the unit was processing three million feet of film a month – seven times the amount rolled out a year before, but with only twice the number of interpreters. Understandably, not all of the film received the detailed examination that it required. However, the importance of timely photo intelligence was certainly being more widely recognised.

In 1965, too, Ryan Model 147D drones, launched from DC-130A/E Hercules 'mother ships', began to acquire useful reconnaissance and electronic intelligence data over North Vietnam, but like the RF-101Cs, they were limited in their vision by frequent heavy cloud cover.

CHAPTER FOUR

COMBAT CAMERAMEN

On 31 July 1964 the Gulf of Tonkin incident occurred, with further alleged North Vietnamese attacks on US Navy vessels on 3 August. US Navy *Pierce Arrow* retaliatory strikes were launched on 5 August and a major increase in local US air power began. The *Able Mable* force was rapidly increased by four more 15th TRS Voodoos and two from the 45th TRS. A CASF of F-105s and more F-100s was deployed to Thailand and South Vietnam. Included in the CASF 'One Buck' were two replacement Voodoos and six more from the 20th TRS at Shaw AFB, which were sent to Kadena on 13 August to boost the depleted 15th TRS, most of whose aircraft and personnel were at Tan Son Nhut.

President Johnson's planned reaction to the subsequent Viet Cong attacks on American facilities in South Vietnam was a two-phase programme of strikes, beginning with 30 days of increased suppression of the communist infiltration in the Laotian panhandle region codenamed *Barrel Roll*. If the Hanoi leadership persisted in supporting these incursions, Phase II would include a series of strikes in the southern part of North Vietnam, moving progressively towards Hanoi.

The first *Barrel Roll* mission was launched on 14 December 1964 with a mixed force of combat air patrol F-100s and a strike force of four 80th TFS F-105s, supported by three RF-101C 'pathfinder' navigation leaders operating out of Da Nang. Capt Paul Subbie explained that this was done 'on missions over North Vietnam because

RF-101C-45-MC 56-0186 of the 20th TRS streams its brake 'chute on touch-down at Udorn. On 13 August 1965 it became another victim of the frantic search for the evidence of the new SAM threat around Hanoi. Returning to base at low altitude, the aircraft was hit by ground fire near Van Yen, 50 miles from the North Vietnamese capital. Although Capt Fred Mellor ejected, he was apparently killed in a shoot-out with local militia. Flak traps were often set up around SAM sites to catch low-altitude reconnaissance flights. As in the Korean War, USAF losses increased whenever aircraft were required to fly at lower altitudes, and even 600 knots in an RF-101C could not defeat the ever-increasing concentrations of AAA batteries and SA-2 sites

The RF-101's centrally-mounted refuelling probe made it easier for a pilot to aim for the 'basket', which in this case appears to be attached to a flying boom system. The hydraulically actuated receptacle normally used for the flying boom was located above the RF-101C's No 2 fuselage fuel cell. Pilots also found the extending probe useful as a means of making rude gestures to other pilots. They were warned, however, not to extend their refuelling probes for long periods in flight unless actually plugged into a tanker's drogue, as delays in making contact could cause fuel to drain from the No 1 fuselage tank back into the wing or external tanks, where it could start a siphoning action that might collapse the wing tanks (*USAF*)

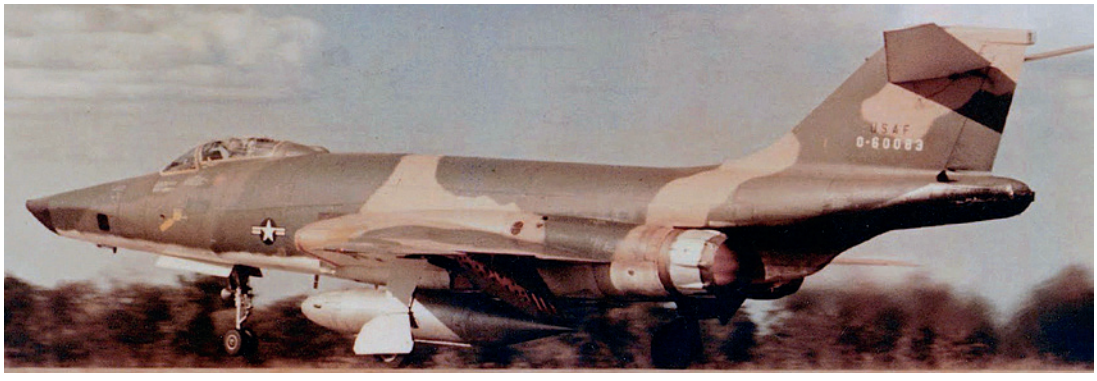
we were equipped with the LORAN system', although some F-105 pilots suffered a degree of wounded pride from being led by an unarmed 'photo bird'. The RF-101Cs also provided post-strike reconnaissance, although this was hampered by low cloud cover. The 14 December mission achieved very limited results. An RF-101C also led the 13 January 1965 attack by 16 F-105Ds on the Ban Ken bridge on Route 7 – two of the Thunderchiefs were lost making multiple passes at the AAA defences. *Barrel Roll* later covered northern Laos, while missions over the south of the country were codenamed *Steel Tiger* from 3 April 1965.

Among the RF-101Cs assigned to the 45th TRS at Misawa AB on 1 November 1964 (the day of a highly destructive Viet Cong attack on Bien Hoa AB, just 16 miles from Saigon) was a batch that had received the Project 1181 modifications during US depot maintenance. Although their ejectable cassette system was seldom used, speedy access to the photo data was always the priority, as former film technician Doug Ayers explained;

'After development, the film was moved to the PI trailer, hurriedly viewed and then the intelligence officers were briefed as to the content. Depending on their assessment of the original negative, it would be duplicated on SP1070 or Niagara printing machines and prints made for distribution to Udorn via the courier jet that came once or twice a day, depending on urgency. Prints were often sent to MACV or to the 460th TRW back at Tan Son Nhut.'

In 1964 MACV placed an increasing emphasis upon using infra-red imaging techniques as a better way of detecting enemy activity beneath thick foliage cover. RB-57s had infra-red equipment that yielded some useful results and the US Army's OV-1C Mohawks also had the capability to identify 'hot spots' caused by cooking fires or vehicles at night. Combined with conventional daytime photography by RF-101Cs, this effort increased the detection rates for enemy targets, including a Viet Cong battalion camp in Phuoc Tuy Province.

One indirect consequence of the prolonged 15th TRS deployment while awaiting relief by Project 1181-equipped 45th TRS aircraft was the first RF-101C combat loss. On 21 November 1964, Capt Burton L Waltz was assigned a *Yankee Team* mission in late-production RF-101C 56-0230, photographing possible traffic movement on Highway 23 north of the Mu Gia Pass. He also had to record imagery of a primitive airfield at Ban Phan Hop, just off the main route. It was a two-aircraft mission,



45th TFS 'Polka Dots' RF-101C-65-MC 56-0083 departs Tan Son Nhut with afterburners blazing. By 1966 the small black serial presentation on the fins of the Voodoos in-theatre was being replaced by slightly more legible white digits, including (in this case) an '0' prefix to indicate that the aircraft was more than ten years old. The wing-flap control had a simple 'up' or 'extended' option, and a clean aircraft would lift off at around 165 knots IAS (*USAF*)

with Capt Kenneth Thomas in the other Voodoo, and an escort of two F-105Ds. After a refuelling session with a KC-135A, they dropped to low altitude and completed the road reconnaissance, attracting some ground fire. Waltz then broke the golden rule of ground attack in Vietnam by reversing direction and making a second pass over the area where the airfield was located. At an altitude of 800 ft and a speed of 480 knots, he began his wings-level photo run.

A 37 mm AAA position, which had shot down an F-100D from the 613th TFS three days earlier, opened up and Waltz felt six hits – the last of these rounds exploded beneath his cockpit. With both engines wrecked, fires breaking out and the inoperable hydraulic system freezing his controls, he ejected just seconds before one of the wings broke away. The RF-101's lack of self-sealing fuel tanks made it very easy for fire to spread quickly through the aircraft. Waltz's parachute did not open fully and he descended too rapidly. Fortunately, he landed in a 100 ft tree just 1500 ft from the AAA site that had destroyed his aircraft. Waltz had added a 100-ft coil of rope to his survival kit, and he started to descend with it, but his parachute tore on the tree branches and he fell 70 ft, fracturing his arm and leg when he hit the ground. While the F-105 pilots dealt with the AAA site, Burt Waltz was rescued by two Laotian Rangers and an Air America UH-34, alerted by Capt Thomas, from the only rescue agency in the area before the USAF set up its own SAR rescue organisation.

The Johnson administration's reaction to this shoot down was to set a minimum 10,000-ft altitude for missions over Laos, denying RF-101Cs their unique view of smaller targets. Waltz's Voodoo was the only RF-101C lost in 1964 during 2081 operational sorties and 4936 flying hours. However, as the conflict escalated, a further 37 Voodoos and 11 pilots would be lost. No fewer than 28 of these aircraft fell over North Vietnam following the commencement of Operation *Rolling Thunder* in March 1965. Twenty aircraft took hits in high-speed, low-altitude flights between June and December 1965, although only three were lost.

BARREL ROLL BDA

The first large-scale F-105 attack in Laos, *Barrel Roll* Mission 9, on 13 January 1965 included sixteen F-105Ds and eight F-100Ds, preceded at 1300 hrs by a low-flying RF-101C. Voodoos from Tan Son Nhut would

Capt Robert A 'Stubby' Stubberfield with a 45th TRS RF-101C at Misawa AB, Honshu, Japan, on the eve of his deployment to Tan Son Nhut. He had flown F-86s, F-89s, F-94s and F-100s with ADC prior to switching to the RF-101 (*USAF*)

The wreckage of RF-101C-60-MC 56-0045, a former 15th TRS/18th TRW aircraft. On 6 May 1965, whilst assigned to the 45th TRS, the jet was flying a low-altitude BDA mission over Vinh Linh barracks at Ben Hai, just north of the DMZ, when it was probably hit by small-arms fire. Pilot Capt Robert A Stubberfield may have ejected as his rescue 'beeper' was heard, but despite a rescue attempt, including flak-suppression sorties by USAF F-105s and US Navy Phantom IIs, no trace of the pilot was found. His remains were returned to the USA in June 1989 (*Dr István Toperczer Collection*)

also be the 'first responders' after the Viet Cong attacked the US Army's Camp Holloway helicopter facility near Pleiku during the early hours of 7 February 1965, killing seven American servicemen and destroying ten aircraft. They made exploratory weather reconnaissance flights for the US Navy-led *Flaming Dart 1* reprisal strike (launched as a result of the Pleiku attack) over contingency target areas at Dong Hoi, in North Vietnam, and their reports of typically heavy cloud cover caused the mission to be delayed.

Attacks by VNAF aircraft on barracks at Chap Le, 15 miles north of the DMZ, the following day utilised three RF-101Cs for pre-strike weather reconnaissance and subsequent BDA. Voodoos were active again on 10 February, finding clear weather over the target area and providing post-strike reconnaissance, although the latter mission was affected by thick smoke.

As the so-called 'Advisory Phase' of the war gave way to an increasing military response to Viet Cong attacks, the reconnaissance task force was reorganised to give better coverage of northern and southern Laos and North and South Vietnam. Prior to the commencement of *Flaming Dart* attacks, any U-2 reconnaissance north of the DMZ had concentrated on airfields, the flow of supplies through Haiphong's port area and the railway lines connecting Hanoi with China.

At Tan Son Nhut, the 45th TRS, with its eight upgraded Mod 1181 aircraft, plus four more Voodoos remaining on standby at Misawa AB, took over the *Able Mable* task from 1 February 1965. Don Muang had by then become overcrowded and was scheduled to house a *Young Tiger* KC-135 detachment to support F-105 and B-52 operations. Udorn RTAFB, close to Thailand's northern border with Laos, was poorly equipped for reconnaissance operations, but funding was allotted to improve its facilities from March 1965. The runway was duly extended and measures taken to prevent the base from being either regularly flooded or choked with red dust. It took much longer to cure the runway faults, however, with pilots having to exercise caution when landing on the wet, slippery surface in heavy rain – the runway was also notoriously narrow.

Udorn was then designated as the base for six KA-45-equipped RF-101Cs from the 15th TRS as *Able Mable Bravo* (soon re-named *Green Python*) for operations over northern Laos and, if necessary, North Vietnam. Distances to those targets were reduced compared with 45th TRS routes from Tan Son Nhut. The first four Voodoos arrived on 31 March, led by 15th TRS commander Maj Robert Crabtree, and they began *Yankee Team* reconnaissance operations the following day. By mid-1965 most of the aircraft had Mod 1181 updates, and the squadron

was generating as many as 14 sorties a day and producing up to 3000 photographic prints from the base's PPC.

Blue Tree missions – part of a long-running US Navy-led reconnaissance programme to identify North Vietnam's reserves of oil, fuel and relevant processing and storage facilities north of the 20th parallel – were flown from April onwards, although they tended to be amalgamated with *Yankee Team* activity and were generally referred to as 'YT' sorties. Tan Son Nhut continued to host the 45th TRS detachment, renamed *Able Mable Alpha*, from 1 February 1965. It was responsible for coverage of South Vietnam and southern Laos.

On 1 May the Thai government permitted up to 12 Voodoos to operate from Udorn RTAFB, and six more RF-101Cs from the 363rd TRW arrived on an indefinite TDY, bringing the Thai total to 11. Those 15th TRS aircraft continued to fly most of the *Barrel Roll* reconnaissance sorties over Laos. 2nd Air Division aircraft were by then undertaking more than 60 per cent of the reconnaissance missions over North Vietnam, with the remaining flights being conducted by US Navy units. In July 1965 Gen Westmoreland asked for more U-2 missions over the *Steel Tiger* trails area as he considered their imagery to be superior to that being acquired by tactical aircraft. He asked for U-2s to be allowed to operate at 30,000 ft – well below their normal altitude – for even clearer photos, but this request was understandably refused.

Unlike the Laotian situation, where RF-101Cs probed the jungle with their chiselled snouts at low altitude and often found very little, the border area of North Vietnam was the scene of open displays of troop concentrations and military supplies, all of which were immune from US attack at the time. Voodoo pilots suffered from the ever-changing RoE north of the DMZ, just like crews of F-105s and F-4s. Many areas were out of bounds, set altitudes above 10,000 ft were mandatory for *Blue Tree* sorties, BDA had to be provided for all attacks to ensure that there had been no 'collateral damage' and every moment of each mission was controlled in advance by the White House. Even minor transgressions by pilots could easily become career-ending offences.

The anti-infiltration effort against the Viet Cong continued into 1966 with the introduction of the *Cricket* programme, in which Cessna O-1 forward air control (FAC) aircraft collaborated with ground-based 'road-watch' teams to track transport targets at close quarters. The information gleaned was then laboriously passed through five stages of communications channels, focused at Udorn, before fighter-bomber pilots could be given coordinates to attack the targets that *Cricket* had located up to 12 hours previously. An RF-101C was sent at dawn to photograph the point at which the detected convoy was thought likely to stop and pull off the road to be camouflaged under trees for the day. A FAC pilot would then search those coordinates from his unarmed O-1 and call in an alert strike flight if he saw signs of activity.

The programme was accompanied by *Gate Guard*, which was an attempt to block nocturnal trails traffic at choke points on the roads so that RF-101Cs could in turn employ their flash photography equipment to detect targets, while other aircraft wielded infra-red detectors or sideways-looking radar in order to locate enemy transport. Generally poor results forced early cancellation of *Gate Guard*.

A 20th TRS pilot photographs his wingman flying literally at tree-top level. The RF-101's forward oblique camera was particularly useful for seeing beneath foliage and camouflage netting to reveal enemy positions. Nevertheless, many of the targets in thinly populated areas were small and hard to see (*USAF*)

The requirement for BDA of every target hit by strike aircraft proved to be an onerous task for RF-101C units, and on occasion the photography could not be obtained within the specified maximum time of 36 hours after an attack. When this happened, Seventh Air Force would often schedule a repeat strike as it could not be sure that the target had indeed been destroyed. Following the first air strike of *Rolling Thunder* on 2 March 1965, two unescorted RF-101Cs photographed bomb damage of Quang Khe naval base from medium altitude, although the imagery obtained was largely obscured by smoke.

Voodoos also acted as pathfinders for the flak suppression flights of F-100s or F-105s in these early strikes, using the reconnaissance pilots' highly developed navigational skills to lead their strike brethren and occasionally provide them with navigational instruction. The RF-101C would then loiter near the target to obtain post-strike photographs, although there was sometimes an inadequate time interval to let smoke and debris clear away so that clear imagery could be taken.

In order to meet the strict 36-hour BDA photography timeframe imposed by the 2nd Air Division upon the commencement of *Rolling Thunder*, the tactics employed by the RF-101C units changed. Reconnaissance pilots would now perform a pre-strike overflight of a fixed target 24 hours prior to the strike, another run just before the strike force arrived and a separate BDA flight about 20 minutes after the bombs had fallen. Photographs from the pre-strike runs, if acceptable, would be couriered (by Thunderchief) to the F-105 bases at Takhli or Korat, both in Thailand, for mission planning and briefing.

Aside from providing target photographs, RF-101 pilots could often give some idea of the potential AAA and missile defences in the area, although the North Vietnamese were very good at re-locating their assets to frustrate the attacker's *Wild Weasel* defence suppression flights. The NVA was also well-prepared for the BDA flight, knowing its timing, heading and altitude so that gunners could set up their weapons to provide a deadly curtain of fire without fear of attack by other aircraft. In that situation the RF-101Cs' high speed and low altitude added little protection against well-prepared and forewarned defences. The predictability of the reconnaissance flights added to their pilots' vulnerability as AAA gunners knew when to expect them and were aware that the RF-101Cs would have to make steady, straight-and-level photo runs. Altitude-fused 37 mm gunfire was the greatest threat in that situation.

President Johnson's frequent 'bombing pauses' to give Hanoi a chance to negotiate did not affect reconnaissance flights, which left Voodoos as the only targets for North Vietnam's concentrated firepower. Capt Wilber 'Newk' Grubb of the 20th TRS was lost in this way on 26 January 1966 during a solo flight near Dong Hoi in the midst of a bombing pause. His aircraft (56-0084) was hit by small-arms fire, lost power and flew into a hill seconds

after he ejected. As a prisoner, he was forced to make broadcasts accusing the US government of breaking the ceasefire. He apparently died from injuries suffered in the ejection nine days after his capture.

Capt Wilber 'Newk' Grubb of the 20th TRS was shot down (in 56-0084) by ground fire near Xuan Son on 26 January 1966. This photograph illustrates the two sides of North Vietnamese behaviour towards PoWs, although in 'Newk's' case the negative aspect dominated once he was incarcerated and became one of eight 1966 'captures' to die in jail that year. In this propaganda photograph he appears to be receiving treatment for a leg wound. Another shot was taken shortly thereafter of 'Newk' being marched along by a group of heavily armed NVA troops. Even so, he died nine days later due (according to the North Vietnamese government) to a 'ruptured spleen and other injuries sustained in his ejection'. A series of brutal beatings by North Korean or Cuban jailers would have that effect too (*Public domain*)

FOREST FORAGERS

In planning their missions – a task that was often compressed in time by the late arrival of the 'frag' (so called because it was only a 'fragment' of the daily Air Tasking Order issued by the 2nd Air Division HQ in Saigon) – pilots were told what scale they should use for the photographs they were tasked with taking. This determined their chosen altitudes, although the latter could be changed by weather conditions encountered at the target. Prior knowledge of the area would then guide the pilot in his avoidance of known defences and the employment of terrain masking or low flying to disguise his presence.

In karst country, where rocky outcrops rose almost vertically to thousands of feet, familiarity with the landscape was crucial, and often a life-saver for fighter-bomber pilots who flew with a Voodoo pathfinder in their strike package. This terrain was also helpful in denying North Vietnamese radar the ability to detect low-flying Voodoos. NVA gunners also found it difficult to track the ground-hugging RF-101Cs, and according to Vietnamese commentator Trung Huyn, the experience of North Korean advisors was called upon and the tactics they used when intercepting US aircraft during the Korean War subsequently employed.

The 45th TRS suffered its first combat loss on 3 April 1965 – the day that US aircraft made their first attempt to destroy the mighty Ham Rong 'Dragon's Jaw' bridge over the Song Ca River, and the first day on which MiG-17s were encountered. Capt Herschel S 'Scotty' Morgan from the 45th TRS was on his 94th combat mission, flying along the Song Ca River looking for an early-warning radar site near Vinh, when his RF-101C (56-0075) was hit by AAA from the Vinkh Quang and Tam Dao Regiments, and the 3rd Company. All three units had batteries grouped closely together in a series of sites defending Vinh. The RF-101C had first been spotted by Hoang Viet Ngo, Company Political Officer at one of the sites. The North Vietnamese press agency reported the engagement as follows;

'The 37 mm guns of the Vinkh Quang Regiment opened up and fire was seen to burst out of the aircraft as it entered a series of uncontrolled rolls and plunged towards the ground.'

Capt Morgan bailed out to become the first of 11 RF-101C PoWs, spending almost eight years in a series of bleak Hanoi prisons.

As *Rolling Thunder* missions began to employ regular tactics, the RF-101C's tasks were also formalised into a pattern of surveillance of trails areas and other supply routes, pre-strike acquisition of target details and post-strike BDA. After the first sightings of Soviet SA-2 'Guideline' SAM sites in April and May 1965, a fourth task was added. RF-101Cs joined the urgent hunt for those missile sites, which posed a severe and largely unexpected threat to the US aerial campaigns. Indeed, SA-2s would

eventually claim five of the 28 RF-101Cs lost over North Vietnam. The increased risks meant that Voodoo pilots, like those in fighter-bombers, were officially ordered to end a combat tour after completing 100 missions over North Vietnam.

Finding SAM sites became a top priority for all reconnaissance units, and RF-101Cs had to fly at altitudes below 1500 ft near suspected SAM sites as the missiles were considered a serious threat above 3000 ft. Solo reconnaissance flights were particularly vulnerable to the missiles at medium and high altitude, and the sites were surrounded by numerous AAA emplacements to catch snooping reconnaissance aircraft at lower altitudes. Nevertheless, Voodoo pilots brought back some of the most detailed and revealing photos of SAM sites and their defences.

At Udorn the 20th TRS flew several test missions in January 1967 with escorting flights of F-4Cs carrying QRC-160 radar jamming pods. They overflew Phuc Yen airfield (home to MiG-17s and MiG-21s) at 14,000 ft, and only one (inaccurate) SAM was fired at them. On the second mission, flown to Kep airfield and two other targets near Hanoi on 19 January 1967, 20th TRS CO Lt Col John Bull Stirling and his wingman got the photos, but also had 18 SAMs fired at them. One of the F-4Cs (64-0845 of the 390th TFS/366th TFS) orbiting to the southwest was hit and the pilot, Capt Julius Jayroe (who had previously flown F-101Cs), headed for the coast. The aircraft became uncontrollable and both crewmen (1Lt G D Kramer was in the back seat) were captured.

On one Hanoi mission in May 1967 a Voodoo pilot had 20 SAMs fired at him in salvos and he managed to photograph the detonation of an SA-2 warhead and the deadly halo of 420 lbs of hot shrapnel that extended in a 200-ft radius around the explosion. Any one of the 8000 metal fragments could have turned the Voodoo's fuel tanks into an inferno, but on that occasion the 'photo bird' escaped any damage.

Tan Son Nhut's reconnaissance units underwent some rationalisation in 1966, their separate geographical, command and control and support aspects being brought together within a single wing, the 460th TRW, with four flying squadrons operating RF-101Cs, RF-4Cs, *Patricia Lynn* RB-57s and RB-66s, together with a technical support squadron. However, the wing's overall effectiveness was diluted by the fact that targets were chosen by ground commanders on the basis of aerial reconnaissance, rather than by USAF or US Army air liaison officers who could better understand the data, and the possibilities for its use, although they lacked the manpower to take on the targeting responsibility.

From early April 1965 MiG-17s also became active, and they claimed the first of 23 F-105 victims on the 4th of that month. Only one RF-101C would be downed by a VPAF pilot, however, and he was flying a MiG-21 (see page 78). Voodoos could outrun the slower MiG-17, and unlike F-105s, they were not encumbered by heavy external ordnance.

After 30 March 1965, in order to enable worthwhile reconnaissance in persistently cloudy conditions, RF-101C pilots were cleared to make low-altitude passes over their assigned targets although they were forbidden to fly within 40 miles of the heavily defended Hanoi and Haiphong port areas and Phuc Yen MiG-17 base. Only ten weekly missions by solo or

pairs of RF-101Cs were permitted north of the DMZ, and fighter or flak suppression flights were sometimes available to support the Voodoos. Some missions were planned for surveillance of road, waterway and rail traffic in North Vietnam, but one of the heavier burdens for the hard-pressed reconnaissance force was the requirement for daily photo surveillance of all the VPAF's MiG-capable airfields.

The SAM threat confined *Trojan Horse* U-2 overflights to SAM-free areas of North Vietnam by the end of 1965 and Lockheed A-12 *Black Shield* flights over the communist north did not commence until January 1968. Much of the reconnaissance burden therefore fell to the RF-101C contingent. A key figure within the tactical reconnaissance community at this time was Lt Col John Bull Stirling (a veteran of combat in both World War 2 and Korea). One of the most experienced Voodoo pilots and a powerful influence in the assignment of F-101A/Cs to USAFE, he took command of the 20th TRS at Udorn in 1966. Later in the war he argued that the RF-101C pilots had contributed at least as much to the USAF effort as the MiG-killing F-4 and F-105 flyers.

His successor, Lt Col (later Lt Gen) James Brickel, led a particularly hazardous BDA mission after the first major strike on the Thai Nguyen steel mill on 10 March 1967. It was the third and final experimental flight using ECM pod-equipped F-4Cs as escort. He and the four Phantom IIs from Ubon approached the target very soon after the last F-105 strike flight had dropped its bombs on North Vietnam's main industrial complex. As the reserve RF-101C broke away, Brickel headed for the smoking target surrounded by copious 37 mm and 57 mm AAA, most of which exploded below him. He set up his straight-and-level photo run as radar-directed 85 mm guns locked onto his speed and altitude. A shell exploded directly below his aircraft, blowing off one of the large engine access doors and most of his right aileron.

Struggling to maintain control of the jet in a smoke-filled cockpit, Lt Col Brickel managed to keep the undamaged left engine running and completed his photo run. Heavy flak bursts followed him across the target and damaged three of the escorting Phantom IIs. All five aircraft then headed for home, and Brickel later received the Air Force Cross for his achievement – the highest honour awarded to an RF-101 pilot during the war. His citation stated that;

'Despite a direct hit by anti-aircraft fire that extensively damaged his aircraft, Lt Col Brickel continued to the target and acquired 100 per cent photographic coverage. He then made a successful withdrawal from hostile territory on a single engine and landed at his home base.'

For *Able Mable* and *Green Python* aircraft, the appearance of SAMs required a rapid change in tactics. Photo missions over North Vietnam had usually been flown at between 20,000-30,000 ft, which was also the optimum lethal altitude of the Mach 3 SA-2. The first USAF jet (an F-4C) was brought down by a SAM on 24 July 1965 – the same day that the first photos of an SA-2 site in-theatre were obtained by a SAC U-2. RF-101Cs were therefore rescheduled for lower altitudes, with adverse consequences for fuel consumption, range and vulnerability to smaller-bore ground fire. 'On the deck' altitudes also interfered with the aircraft's radio contact with the command post that ran the mission.

To reduce the chances of a lock-on by a SAM's 'Fan Song' search radar, Voodoo pilots used a 'pop-up' manoeuvre that was also common in the fighter-bomber community and adopted by RF-101C units from the latter part of 1965. The manoeuvre also reduced the chances of hits by AAA compared with the standard USAFE-style low-level approach that most pilots were used to. Closing on a target such as a suspected SAM site at low altitude, the pilot engaged afterburner about five miles out and climbed to around 10,000 ft for a photo run of two or three minutes with his KA-1s, before returning to low altitude. Capt Paul Subbie employed this tactic during his combat tour;

'Tactical missions required flying on the run-in to the target at around 600 mph, doing a pop-up and roll-over about a quarter of a mile before the target and running the cameras, followed by a rapid descent while adding afterburner and exiting the target area as fast as possible, still in afterburner. The Voodoo had plenty of power on tap, and the faster you left the target area the harder you were to hit.'

An RF-101C overflies a 100 mm AAA site, capturing both its shadow and the heavy guns with a panoramic camera. In 1965, Voodoos were unable to photograph the increasing numbers of SAM sites around Hanoi since they were not permitted to fly within 40 miles of the city. As losses to SAMs mounted, several 15th TRS aircraft made test flights against Kadena AFB's similar Hawk SAMs and found that regularly changing heading by 30 degrees and altitude by at least 5000 ft every 30 seconds would stop the missile's radar from holding a lock onto the RF-101C. However, such violent manoeuvres were obviously impractical during a photo run, although the tests did help to evolve the 'pop-up' manoeuvre in which pilots approached the target at 100 ft, climbed at 40 degrees to 20,000 ft for 30 seconds, descended to 10,000 ft and then returned to 20,000 ft, before descending to a low egress altitude. It was found that split vertical cameras could give clear results (albeit without overlap) at 10,000 ft, rather than the official minimum altitude of 15,000 ft (*USAF*)

SAM SEARCHERS

After 24 July 1965, tactical aircraft, including RF-101Cs and the early F-100F *Wild Weasel* conversions, devoted many missions to the search for live SAM sites across most of North Vietnam. An early success came on 27 July when Capt Jack Weatherby flew a Tan Son Nhut-based RF-101C near Hanoi and photographed a site. He and Maj Jerry Lents volunteered to fly a similar mission west of Hanoi two days later. They took off shortly after another pair of Voodoos that were flown at low altitude by Majs Marv Reed and Dan Doughty, who survived extremely intense AAA of all calibres to get KA-1 photos of a SAM site 40 miles southwest of Hanoi that had downed the F-4C on 24 July and damaged three other aircraft.

The Yen Bai site had been re-filled with fake missiles and it was surrounded by a flak trap of 100 mm guns, but Weatherby and Lents were told to re-photograph it nevertheless. Weatherby's aircraft (56-0067) had an inoperable radio, so Lents organised their in-flight refuelling session, both jets descending through thunderstorms to cross North Vietnam at 200 ft and 600 knots – skills that Voodoo pilots had perfected in USAFE.

Nearing their Yen Bai objective, Weatherby's aircraft was hit by a single round in its belly as he crossed the target. The bullet started a minor fuel leak from a forward tank that was enough to cause a fire which spread through the whole aircraft within seconds. Although the tail section eventually came away, Capt Weatherby stayed with his aircraft, probably hoping that he could spot the SAM site and even

photograph it. His fuel tanks suddenly exploded, and at an altitude of 200 ft he had no chance of ejection. Weatherby was subsequently awarded a posthumous Air Force Cross. Reed went on to fly 330 combat missions, and he was the first 45th TRS pilot to complete 100 missions over North Vietnam. In 1966 the USAF placed a 100-mission cap on combat tours, partly in the face of increasing losses.

Capt Fredric Mellor of the 20th TRS at Udorn became another victim of the urgent SAM hunt west of Hanoi on 13 August 1965. Leaving the target area at the prescribed low, SAM-avoiding altitude, his aircraft (56-0186) burst into flames after hits by ground fire. His wingman made radio contact with him, but by the time a rescue attempt could be made Mellor had apparently been found by local militia and killed in a shoot-out with them.

Reconnaissance work over North Vietnam was becoming a very high-risk occupation, and around 20 Udorn-based RF-101Cs took hits at low altitude and at their maximum speed in 1965. Four were lost. Avoiding the known flak sites had been possible in the early stages of the conflict, but by the summer of 1965 the enemy's defences proliferated and mobile light AAA units could be encountered almost anywhere in North Vietnam.

SA-2s claimed 20th TRS RF-101C 56-0093, flown by Capt Vincent Connolly, on 4 November 1966 as the unit's first confirmed loss to a SAM. It is highly likely that the squadron had also lost two Voodoos to 'Guideline' missiles on 7 March 1966 during a mission in the heavily defended Vinh area, Capts Jerdy A Wright (in 56-0043) and his wingman Gordon L Page (in 56-0220) initially being listed as Missing in Action. Confirmation of what caused their demise was never forthcoming,

A line-up of 20th TRS Voodoos at Udorn with former World Speed Record holder 56-0119 and 56-0215 (with an open camera bay) in the foreground. The latter was transferred to the 45th TRS and flew a BDA mission after a 28 June 1966 attack on the Viet Tri bridge by F-105s led by Maj James Kasler. The Voodoo was eventually brought down by AAA on 6 August 1968 when Maj G D Harlow was making a second run at a potential target near Thach Ban in North Vietnam – Harlow ejected safely over the sea. It was the last RF-101C combat loss of the war (*Terry Panopalis Collection*)

however, the pilots' remains finally being identified from samples handed over to the USA in 1989. They had possibly been the victims of a mid-air collision, although circumstantial evidence based on unidentified radio traffic at that time suggested that their Voodoos had both been hit by one or more SAMs. An F-105D had been downed in an attack on a SAM site only ten miles from the RF-101Cs' last known position just an hour previously.

During a strike near Kep on 4 November, F-105F *Wild Weasel* 63-8273 was struck head-on by a SAM as the crew attacked the site. Some 30 minutes later, Connolly's aircraft was hit at 3000 ft by another SA-2 launched from a site at Hoang Xa, 15 miles south of Hanoi, as he flew in to obtain BDA photographs following a road-bridge attack. The Voodoo immediately disintegrated, killing the pilot.

As the SAM threat increased, Voodoos became the first USAF tactical aircraft to employ the hastily developed QRC-160 ECM barrage noise jamming pods to 'blind' enemy defensive radars in support of *Rolling Thunder* F-105 strike forces. The 90-in.-long pods, each weighing more than 200 lbs, were delivered to Kadena AB in March and test-mounted on several Mod 1181 RF-101Cs. A strike mission on 29 April 1965 included three 45th TRS aircraft with up to four pods each, tuned to defeat both 'Fire Can' gun-directing radars and the powerful 'Fan Song' system that guided SA-2s. USAFE RF-101Cs had not previously been equipped with ECM systems, so experienced pilots from this theatre who flew Voodoos fitted with the QRC-160 pods over North Vietnam tended to ignore its signals and rely on their own 'eyeball' impression of the threat situation. Capt Paul Subbie was one of the 45th TRS pilots who used the pods, however;

'In April 1967 improved QRC-160-1s were fitted to some RF-101Cs to offer better protection from SAMs by scrambling the SA-2's radar guidance equipment, but there was a trade-off. The external pods created additional drag on the aircraft, lowering your maximum airspeed. On those missions the slower speed made us vulnerable to MiGs, and an F-105 escort was required because they were armed and we were not. I flew with the pod twice, but hated the slower speed – the latter was, after all, the Voodoo's main defensive advantage. On the third mission I flew alone, and felt much safer. As our motto said, "alone, unarmed and unafraid". Missions flown over North Vietnam, however, required an escort because of the AAA batteries and SA-2 sites staged around major targets.'

Voodoos were diverted from their reconnaissance task by this ECM requirement, and their performance and handling were adversely affected by their external load. The pods proved to be too fragile to withstand the vibration incurred in low-altitude, high-speed flight, tending to fall apart inside. This caused intractable maintenance problems. Also, their aerodynamic effect on the RF-101C's wing was potentially disastrous. Mounted on short underwing pylons just inboard of the wing fence, they disturbed the airflow over the outer portion of the wings to such an extent that they made them twist downwards. The QRC-160s were soon returned to the USA and replaced by more robust General Electric QRC-160A-1 (re-named AN/ALQ-71) versions, although these pods went to F-105 squadrons rather than those equipped with RF-101Cs.

Voodoos used the US Navy-sponsored AN/ALQ-51 deception jammer instead as this could be internally mounted, precluding the wing-warping problem. Furthermore, the system was automatic, emitting its signals only on receipt of hostile transmissions from a targeting radar. It used two short antennas below the forward fuselage ahead of the air intakes. The new ECM equipment did not save Capt Charles Winston's aircraft (56-0207) from being shot down by an SA-2 on 1 August 1967, however, the 20th TRS pilot being killed when his jet had its right wing blown off while flying at 18,000 ft over Vinh Yen. Despite the advent of the AN/ALQ-51, it soon became clear that a Voodoo pilot's best chance of survival against SAMs was avoidance, preceded by effective warnings from a wingman if one was assigned to the mission.

GREEN PYTHON LOSSES

The Udorn-based 15th TRS had lost its first *Green Python* aircraft on 29 April 1965, RF-101C 56-0190 being part of a two-aircraft BDA mission over northern Laos in bad visibility. Capt Charles Shelton had to abandon his first target due to low cloud, and he proceeded at 3000 ft to the second – the Pathet Lao HQ at Sam Neua. His jet was hit as he approached the target and the fuel tanks caught fire. After a successful ejection, witnessed by villagers, Shelton called in rescue helicopters, but they had to depart due to poor visibility and he hid for three days before being captured by Pathet Lao troops. In all, 140 sorties and rescue attempts by local Hmong tribesmen were mounted, but Shelton was never found. Many stories of his escape, recapture and eventual transfer to North Vietnam circulated until, in 1994, he was finally declared killed in action. For many years he was the only one among 2500 US servicemen unaccounted for at war's end not to be officially declared deceased.

The 15th TRS's operations officer, Lt Col Raymond Lowery, who was a 'visitor' with the 363rd TRW detachment that had been sent to Udorn, almost faced the same fate on 1 July. AAA damage to his rudder controls forced him to make a crash landing at the Thai base, and although he was extricated from the wreckage with only minor injuries, the Voodoo was written off. However, Lowery fared better than Capt Marvin Lindsey, also from Udorn, whose aircraft (serial unknown) was hit by ground-fire during a BDA sortie near Son La in northwest North Vietnam on 29 June. Although no ejection was seen, he may well have been shot as he descended by parachute.

Pre-strike sorties also became hazardous as the North Vietnamese learned to expect a lone Voodoo at a fairly predictable time ahead of an attack. Bridges were among the most common targets for early *Rolling Thunder* missions, and they were usually surrounded by AAA sites – particularly the major rail and road bridges such as the one at Ninh Binh on the main line from Haiphong. Capt George Hall, a 15th TRS *Green Python* pilot, flew the pre-strike sortie – his 196th Southeast Asian mission – for that target on 27 September, crossing over the bridge at 500 ft and 540 knots. Even at that speed, a curtain of AAA lacerated his RF-101C (56-0204), setting its fuel tanks on fire.

Capt Hall followed standard survival practice and headed for the coast, although he had to eject seconds later. He subsequently recalled reaching for the ejection handle, but his next conscious memory was of lying on a table in great pain caused by severe injuries during his ejection, surrounded by North Vietnamese villagers. He spent seven years in a Hanoi prison with 'Scotty' Morgan, the first RF-101C PoW, Hall being listed as Missing in Action for the first 16 months of his incarceration. On his return to the USA, he was awarded the Silver Star and converted to the RF-4C.

5 October 1965 was a particularly bad day for fighter pilots over North Vietnam. Six US aircraft were shot down, five of them by AAA, including 15th TFS RF-101C 56-0178 flown by Capt Robert Pitts. He and wingman Maj Tony Weissgarber had been tasked with collecting BDA photography of the Lang Met bridge and a nearby ammunition storage area 40 miles northeast of Hanoi under a 3000-ft cloud ceiling immediately following a strike by F-105s and F-4s, three of which had been downed by AAA. The two reconnaissance pilots approached Lang Met at a height of just 100 ft and a speed of 600 knots, splitting up near Hanoi to photograph the two targets. Even at that speed Pitts noticed a soldier posted on a hill-top as look-out for their anticipated approach.

Moments later both aircraft were hit by heavy AAA fire just short of the target. Once again, a fuel leak rapidly turned into a major conflagration in Pitts' aircraft, although it was confined to his left engine. Indeed, the 100-ft long flames stopped when Pitts shut it down. He had to head for the coast, leaving Weissgarber to capture the required images despite damage to his aircraft. Assuming responsibility for both targets, Weissgarber turned back for his photo runs and felt another substantial AAA hit, and a third one on his exit route over the same guns that had hit them on their arrival. When the two pilots joined up again it was obvious that Pitts' aircraft was severely fire-damaged, but still flying.

They were able to reach Da Nang, although Pitts was unable to extend his refuelling probe for much-needed fuel due to general hydraulic failure and Weissgarber's aircraft was leaking fuel as fast as he could take it on. With less than 200 lbs of fuel remaining, Pitts attempted a landing using his back-up systems for the flaps and undercarriage. Unfortunately, there was no rudder or nose-wheel control and the Voodoo gradually veered off the runway after touch-down. Its landing gear broke away and the aircraft slithered into a radio hut before completing its last landing. Capt Pitts ran from the wreck uninjured, and the lack of internal fuel at least prevented a fire. Weissgarber checked that Pitts had survived and he then headed back to Udorn with the crucial film. As he taxied in his RF-101C was leaking fuel profusely from severe damage, and he quickly shut down the engines in time to prevent a fire. The aircraft never flew again. Weissgarber was duly awarded a Silver Star for his extraordinary mission.

Another victim of the SAM site hunt was Capt Norm Huggins, whose 45th TRS RF-101C (56-0174) was hit by ground fire on 1 November 1965. He just managed to cross the coast before ejecting from the aircraft and swimming ashore, only to be met by gunfire from local villagers. He swam back out to sea, whereupon a duel then ensued between four F-105s and a number of boats that set out to capture him. Additional covering fire came from the crew of an Albatross amphibian that landed to pick Huggins up.

MiGs MAKE A MOVE

The MiG-17 pilots of the 921st Fighter Regiment had been gaining in skill and confidence throughout 1965, but their first serious attempt to interrupt an RF-101C mission was frustrated by the skill and determination of two Voodoo pilots. Attempted interceptions began on 12 October 1965 near Yen Bai, but the Voodoo pilots, given adequate warning, outran the VPAF fighters and avoided their gunfire.

On a 15 November mission northwest of Hanoi, the watchful wingman noticed two MiG-17s pass above and behind them as his leader commenced a photo run over Yen Bai. The MiGs began a diving attack on the lead RF-101C but the wingman inserted himself between his leader, who continued his photo task, and the VPAF fighters. He was able to perform the very difficult feat of manoeuvring the Voodoo sufficiently to prevent the MiGs from gaining a firing position, and then resorted to afterburner and a dive to 100 ft while the lead RF-101C escaped in a different direction, zoom-climbing out of a foggy valley up to 44,000 ft.

Upon seeing that the fleeing Voodoo was attracting a hail of gunfire from up to 200 AAA sites as it howled across the city of Yen Bai on the deck, the MiG-17 pilots prudently broke off their pursuit, leaving two Voodoos to return undamaged to Udorn with some valuable film results. Apart from the risk from their own AAA, the MiG-17 pilots suffered from flying controls that became virtually inoperable at that speed and altitude.

Two RF-101C pilots also used the Voodoo's superior speed and acceleration to evade a flight of four MiG-17s that fired at them from a distance of 4000 ft in the same area on 26 November. Similar tactics by Capt Richard Cooper and Maj Hallet P Marston on 17 March 1966 frustrated four firing passes by MiGs near Dien Bien Phu, although thick haze also helped the Voodoos to escape.

Like the F-105, the RF-101C's best defence against the far more manoeuvrable MiG-17 was its ability to dive away and quickly reach supersonic speed. Apart from some distant, inconclusive contacts, RF-101Cs were seldom threatened by the much faster MiG-21 at this time, although one unsuccessful interception was attempted on 23 April and a second on 1 January 1967, when a Voodoo pilot's AN/APR-25 showed a MiG-21 moving into position behind him. The MiG pursued him as far as the Laotian border at Mach 1.05 in thick cloud.

The AN/APR-25 Vector IV radar warning receivers used two small 'bug eye' antennas on the tip of the nose, with another pair on the drag 'chute door. RF-101Cs (together with F-1015F Wild Weasels) were among the first aircraft to use this protection after initial tests at Shaw AFB in an RF-101A. From May 1966 they were installed in Udorn's RF-101Cs, together with the AN/APR-26 receiver which could detect signals fromb SA-2 launch sites and differentiate between detection by the weapon's 'Fan Song' radar and a lock-on and imminent missile launch against the target aircraft. An APR-25/26 warning alerted a pilot via headset sounds and a tele-light display on a 16 January 1967 mission, enabling him to elude a MiG-17 that was being vectored into a head-on attack.

Some pilots never saw MiGs. Capt Ed O'Neil of the 20th TRS flew 59 RF-101C missions without a glimpse of one, despite conducting sorties over North Vietnam's most heavily defended targets. SAMs, though,

could be expected whenever a pilot climbed above tree-top height. Two MiG-17s were avoided on another mission at the end of January 1967 when a Voodoo pilot noticed them overhead and dived to 100 ft for a prudent escape, and another was evaded by a pair of RF-101Cs close to the Laotian border.

APR-25/26 enabled a pilot to steer clear of SA-2 sites and 'Fire Can' radar-directed guns as long as he could concentrate on interpreting the warning signals on his display as part of an intense cockpit workload. He also had to 'jink' the aircraft constantly over hostile territory to spoil enemy gunners' aim, except during the designated target photo run. At very low altitude and maximum speed that alone was an exhausting requirement.

Having evaded MiGs in March 1966, Maj Marston was one of the first RF-101C pilots to make a solo *Blue Tree* sortie after the mid-June 1966 Seventh Air Force edict that single Voodoos rather than pairs should fly reconnaissance missions within the most heavily defended target areas of North Vietnam. He brought back graphic images of a devastating strike by F-105s on a large petrol, oil and lubricant (POL) storage area in Hanoi. By April 1967 pairs of RF-101Cs were once again in favour, often with an airborne spare aircraft in case one of the two jets had a technical problem, in which case both pilots would usually have to return to base, aborting the mission.

Despite the RF-101's considerable fuel reserves, many missions into North Vietnam left pilots close to the minimum, particularly when they had to cover several targets and evade SAMs or MiGs en route. Although tankers sometimes broke the rules and ventured outside their prescribed refuelling tracks to meet fuel-starved tactical aircraft, a refuelling hook-up was not always possible. In those circumstances RF-101C pilots would climb above 40,000 ft to commence a long descent to Udorn at idle power settings.

THE COST OF FILM

As the number of reconnaissance missions being flown in the high-risk areas of North Vietnam and the density of AAA coverage increased, losses to low-flying RF-101Cs inevitably worsened. Low altitudes provided some immunity to SAMs, but pilots believed that enemy troops used field telephones to warn of approaching Voodoos so the NVA could set up barrages of small arms and light AAA fire in advance of their arrival. Capt Art Burer was hit by 23 mm fire at very low altitude on a 45th TRS coastal reconnaissance mission near Hon Me on 21 March 1966. The vulnerable fuel tanks of 56-0066 soon turned the aircraft into a fireball and he ejected into seven years of captivity.

Capt John H Rogers, on a similar 45th TRS mission on 8 February 1967, also sustained hits from coastal automatic fire that turned his Voodoo (56-0203) into a hurtling conflagration. He was more fortunate in being able to direct the blazing jet eight miles out to sea before ejecting and awaiting rescue by a US Navy destroyer, which beat local junks and fishing boats in the race to retrieve him. Cannon fire from an A-1 Skyraider was also helpful in preventing his capture by booty-hunting fishermen. Rogers' mission was not in vain as he was able to give a visual report of very heavy supply-lorry traffic on the Highway 1 route that he had photographed.

Squadronmate Capt Denis Haney had had a similar experience after being hit on 3 November 1966 over the supposedly neutral DMZ, which the North Vietnamese were filling with military materiel and air defences. He turned seawards in 56-0175 at 7000 ft and ejected two miles from the coast, where a USAF helicopter pulled him out of the water. Haney was at least able to provide visual confirmation of heavy AAA defences. On 2 April 1966, 45th TFS pilot Capt Dan Doughty was hit by ground fire in 56-0172 while negotiating the Annamite Mountain passes south of Vinh and also had to eject, but was captured.

Engine heat often scorched the camouflage paint around the jet pipes, although 45th TRS RF-101C-65-MC 56-0080, tied down for engine tests at Tan Son Nhut in 1967, appears to have suffered from more severe fire damage. Nevertheless, it survived years of combat and went on to fly with the Mississippi ANG until 1979. AN/APR-25 RWR antennas can be seen attached to the brake 'chute door. Tests of the aircraft's RWR showed that RF-101C pilots would probably not be alerted to the X-Band SRD-5MK air-to-air radar of a MiG-21F-13 until the enemy fighter was within about two miles of its target and in a position to launch an 'Atoll' air-to-air missile. Large engine-access doors helped the Voodoo 'Medicine Men' with their maintenance tasks, which often including patching up metalwork and paint after damage by small-arms or shrapnel. However, the two drop tanks had to be removed in order to work on the engines. The steel-plank revetment surfaces and undulating runways in Thailand caused heavy tyre wear, and with their two 450-gallon external tanks adding weight, the aircraft often needed a tyre change after three landings rather than the usual six on standard runways. (*Terry Panopalis Collection*)

Three months later, on 6 July, Maj James Young's 20th TRS aircraft (56-0051) was hit during a reconnaissance flight along Route 50 near the Laotian border and he too spent seven years as a PoW.

The disappearance of Maj William D Burroughs' Udorn-based aircraft on 31 July 1966 was puzzling at the time. He was one of a fated minority of pilots to be shot down on their 99th mission, which, in his case, was a pre-strike sortie to a bridge at Bac Ninh, near Hanoi. Burroughs, also from the 20th TRS but detached to the 15th, vanished near the target without any radio contact, and his fate remained unknown until, on his release from prison in 1973, he could describe how his Voodoo (56-0226) was hit by 37 mm AAA rounds during the photo run and he had to eject at an altitude of just 500 ft.

By the end of 1966 attrition was beginning to seriously affect the operations of the Southeast Asian RF-101C squadrons. Twenty-six aircraft had been lost and the 15th TRS at Kadena, which had acted as a one-for-one replacement source, had run out of Voodoos. By the time the RF-101C was retired in 1979, more than half the production run of 166 aircraft had been written off due to combat losses or other accidents.

Seventh Air Force was not only short of aircraft by late 1966, it was also facing a pilot crisis. Most of the 15th's pilots had completed their 100-mission tour requirement prior to the squadron's withdrawal to Kadena after its replacement by the 20th TRS, these aviators duly moving on to other assignments. Like the tactical fighter wings committed to the Vietnam War, the two RF-101C tactical reconnaissance wings had to take on an increasing amount of operational training themselves in order to support Shaw AFB's extended 94-hour course. Newly arrived pilots would complete their first missions in fairly safe areas with instructor escorts, before venturing into Laos or North Vietnam after ten 'milk run' missions over South Vietnam. The RF-101's heavy cockpit workload required pilots to have many hours of flying experience before they were allowed to transition to the aircraft at Shaw AFB's 'reconnaissance school'.

CHAPTER FIVE

TO THE LIMITS

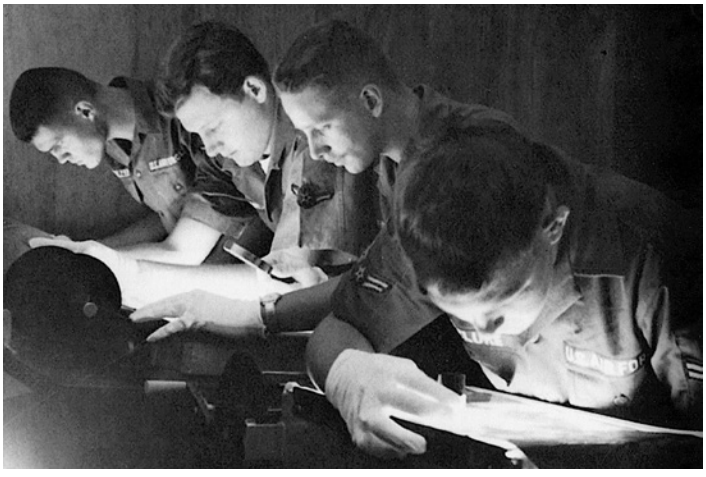
Tan Son Nhut's 460th TRW RF-101Cs were allocated AH tail codes from mid-1968 for Det 1 of the 45th TRS, while the co-located RF-4Cs of the 12th TRS were coded AC and the 16th TRS Phantom IIs adopted AE codes. RF-101C-75-MC 56-0115, a former 66th TRW machine, soaks up the midday sun in its revetment. The intake covers helped to deter Viet Cong sappers from throwing satchel charges into the engines, but an open cockpit at night would have been a tempting target (*USAF*)

Operation *Rolling Thunder* placed increasing demands on a diminishing RF-101C force as pilots sought to cover all the types of targets selected by Seventh Air Force planners, and also continue to provide the majority of BDA missions over North Vietnam. Phases of the campaign focused on bridges and transportation, airfields and army barracks, and POL. Invariably, these missions required RF-101C pilots to fly into heavily defended urban areas at low altitude. However, the results could be of considerable use to planners.

For example, when the communists realised that the US government was serious about avoiding damage to the dykes that prevented the Red River from flooding large areas of the country, the order was given from Hanoi to hide fuel tanks and drums under them. Voodoo photography quickly revealed this practice, as well as the use of temporary river crossings after attacks on fixed bridges. They also identified disguised Soviet armoured vehicles and a Mil Mi-6 heavy-lift helicopter conducting re-supply missions to Dien Bien Phu.

When the Johnson administration declared one of its regular truces, like the Christmas 1966 bombing pause or the five-day Tet celebration in January 1967, Voodoo pilots continued with their missions and recorded the massive increase in traffic on the trails network and waterways that these periods of safety from air attack allowed. Given, in effect, official permission to travel and plenty of advanced notice of the truce,

thousands of trucks, barges and small vessels shifted enormous quantities of supplies to the Viet Cong in South Vietnam as they began their preparations for an offensive against the Saigon government. Highly visible on RF-101C film footage from the southern areas of North Vietnam during these bombing pauses were 2799 trucks, 3112 boats and rafts, an Mi-6 helicopter and various amphibious craft, all being used by the NVA to re-supply the Viet Cong.



There were no Purple Hearts awarded for eye-strain, but this view gives some idea of the intensity of the PIs' work at Tan Son Nhut AB. RF-101C flights generated prodigious amounts of film footage and pilots were not encouraged to be economical in their camera use, resulting in work overloads at the processing facilities and a tendency to evaluate missions on the basis of the amount of film exposed. As finite, identifiable targets were scarce in areas like Laos, this equated in some ways to the general Vietnam War practice of assessing military success by the tonnage of bombs dropped, rather than the number of valuable targets that were definitely hit. The magazines for KS-72A 6-inch focal length cameras contained 500 ft of film, and with three of these cameras fitted and firing at the rate of six exposures per second, an RF-101C could return with more than 3600 images from the KS-72s alone. They all required close examination by PIs peering through magnifying loupes to detect signs of enemy activity, but the small 4.5-in² negatives were less acceptable in PPIFs and command posts than the large-format KA-2 shots (*USAF*)

Although the tactical reconnaissance task was gradually passing to the RF-4C, the Voodoo's cameras could still provide their unique large format, high-definition imagery that was particularly valued by ground commanders. KA-1 large-format 9-inch x 18-inch plate cameras were ideal for picking out the smallest details when film was examined on the laboratory light-table. Burned areas of grass could indicate a recent cooking fire, tyre tracks were sometimes visible in mud and tonal differences in foliage could show camouflage in use over a vehicle park or a gun position. The unique 36-inch KA-1s remained in the RF-101C camera rig during the jet's last years of combat, and it was the favourite camera for BDA, although other changes were made periodically until the standard camera fit was established in early 1969. Small-format cameras appeared in the other two stations, namely a 12-inch KS-72 in the nose oblique position, and a pair of 6-inch KS-72 split verticals and a 3-inch panoramic camera in the second camera bay.

Another 1969 improvement was the installation of high frequency sideband radios and *Seek Silence* secure communications equipment in all RF-101Cs. This was part of a Seventh Air Force programme to provide real-time secure signals capability between the pilot and ground commanders during a mission, denying North Vietnamese intelligence one of their information sources.

In order to speed up the transfer of intelligence data to higher command, Udorn pilots en route from photographing top-priority targets were often ordered to refuel on their outbound flight and land at Tan Son Nhut, near Saigon, so that the laboratory could rush the prints straight to Seventh Air Force HQ. The Voodoo pilots then had to complete the trip back to Udorn, where air- and groundcrew prepared both themselves and the jets for a repeat of this routine. RF-101C units also routinely mounted a two-aircraft alert at Tan Son Nhut to cover urgent requirements in Laos or North Vietnam. Pilots on alert would re-join the normal mission schedule after a few hours if there were no emergencies, to be replaced by other crews. Sometimes, an alert pilot could find and stay with a target, wait while it was attacked by strike aircraft and then perform BDA, all before returning to base. Catching transportation targets before they moved on was always the main challenge in the trails war.

Facilities at Udorn were improved by the installation of a WS-430B photo Processing Printing and Interpretation Facility (PPIF) in 1967. Film technician Doug Ayers worked in the PPIFs at Phu Cat and Tan Son Nhut;

'The PPIF was designed and constructed by Goodyear Aerospace. It consisted of 24 interlocking mobile "boxes" which were connected by tent-like passageways. They were self-supporting with their own generators and portable water tank. Film from reconnaissance cameras, gun cameras or personal 35 mm film could all be developed and viewed. Although designed to be self-supporting in a hostile environment, the PPIF was actually a death trap because of the thin aluminium honeycomb sandwich walls with no windows, plus the sound of three or five-ton rated air conditioners running inside and MB15 kw generator running outside. These were so loud that several rocket attacks were not even heard by guys working inside as [Viet Cong] 122 mm rockets hit the flightline where PPIFs had been set up for fast turn-around with the aircraft.'

PPIFs at Phu Cat and Tan Son Nhut produced up to five million feet of film per month. Equipment installed in them included the Eastman Kodak Niagara roll printer, among other advanced photo printers, and a series of refrigerated units to store chemicals and film. An operational PPIF could produce useable prints within 30 minutes of a Voodoo landing. One Tet sapper attack on Tan Son Nhut destroyed a PPIF, and theft of valuable equipment from the mobile 'boxes' was commonplace.

In October 1966, personnel from the 32nd and 38th TRSs (formerly based at Ramstein – their aircraft were ferried back to the USA by other crews) gathered at Mountain Home AFB, Idaho, and then left for Tan Son Nhut a few days later as the RF-4C-equipped 12th TRS 'Blackbirds'. At Udorn, meanwhile, the transition to RF-4Cs had commenced with the 11th TRS, which began operations in mid-September 1966.

At around that time the reconnaissance effort was divided so that Udorn aircraft were responsible for North Vietnam and northern Laos, while Tan Son Nhut's three squadrons would operate over South Vietnam and the southern sections of Laos and North Vietnam. The expansion in the number of reconnaissance squadrons in the area also brought a division of command within their parent 460th TRW.

On 18 September 1966, the 432nd TRW was established at Udorn under Col Robert W Shick to control all reconnaissance activities at the base. It was to become one of the most diverse and successful of all the tactical wings that participated in the war. Its RF-4C units were the 11th TRS, created out of the Shaw-based 9th TRS (via a temporary designation as the 6461st TRS) from October 1966, and the 4th TRS, attached from the 75th TRW at Bergstrom AFB on 28 October 1967. By the end of that year the RF-4C contingent in Southeast Asia numbered more than 70 aircraft – very different from the modest-sized detachments of four to six RF-101Cs that provided tactical reconnaissance in-theatre three years earlier.

Deliveries of RF-4Cs to Shaw AFB began in September 1964, five months after the first production example's maiden flight. In addition to its multiple advanced sensors and night photography capability, the photo-Phantom II had the advantage of an AN/APQ-99 radar which could provide terrain-following or mapping modes that could be monitored

by both crew members. The RF-101C's heavy navigation workload was lessened by an AN/ASN-46 navigation computer, although exact target location still required considerable crew input. However, as Capt Paul Subbie recalled;

'Although the systems in the Voodoo kept you fairly busy with cockpit management, it was done in a fairly roomy workplace. Even with all your flight gear – a K-2B flightsuit, CSU-3/P g-suit, survival vest, HGU-2A/P flight helmet and MBU-5/P oxygen mask – on, you were still quite comfortable. It felt like strapping on the Voodoo – man and machine acting as one.'

As RF-101C operations in Southeast Asia began to wind down, some crews converted to the RF-4C via short courses at Shaw AFB. They quickly learned to appreciate having a second crewman to share their complex tasks. However, the nature of most missions from 1967 onwards remained much the same as it had in the Voodoo period – fighting through the defences at low altitude and maximum speed to secure target photos or BDA in heavily defended areas. The wartime losses of 83 RF-4Cs between 1966 and 1972 resulting in 65 fatalities, 39 of them over North Vietnam, showed that the dangers facing tactical photo-reconnaissance crews were even greater.

Despite the increasing number of RF-4Cs in-theatre, Voodoo pilots also continued to explore the tough targets. On a 1 May 1967 mission, 20th TRS operations officer Lt Col James R Brickel led two aircraft over Hoa Lac MiG air base, outmanoeuvring two SA-2 missiles in the process and returning with full photographic coverage. His award of the Distinguished Flying Cross for this mission was followed by a BDA sortie near Hanoi on 21 May (by which time he had taken over the 20th from Lt Col John Bull Stirling), from which he brought back the crucial photographs despite fierce opposition from SAMs and AAA. Brickel was awarded the Silver Star for this mission – just one of 106 hazardous flights he completed over North Vietnam with the squadron between November 1966 and September 1967. At the beginning of that period 20th TRS pilots were being lost at the rate of one per week on hazardous missions 'in the barrel', as pilots put it. Some returned with reports of up to 15 SA-2s being fired at them.

Pilots (and 'back-seaters' in RF-4Cs) were very much involved in assessing the hard-won products of their missions, as film technician Doug Ayers recalled;

'After the original negative film was downloaded on the flightline by the avionics people, it was driven over to the PPIF. Pilots and back-seaters would usually ride in the same pick-up because the PPIF personnel were also able to provide operations and intelligence debriefs. Many times, if warranted, they would stand at the take-up spools of the Versamat processors to view their mission's film as it came off [the machine]. At numerous times this was very emotional, as the stories of BDA or enemy troop movements or friendly fire or bombs placed too close to American positions were revealed.'

Hard use as well as attrition contributed to the RF-101Cs' declining employment in Southeast Asia. Shortages of parts, overloaded engine depot maintenance facilities and ever-increasing operational demands began to eat away at the Voodoo fleet. Airframes were subjected to fatigue-inducing

45th TRS Voodoos are prepared for another mission at Tan Son Nhut AB. RF-101C-55-MC 56-0211 was an ex-66th TRW aircraft that also flew with the 363rd TRW and finished its career with the Mississippi ANG. Although it required many man-hours by the 'Voodoo Medicine Men' to keep the RF-101 airworthy, the aircraft was easier to maintain than its RF-84F predecessor. Indeed, most of its 'innards' could be reached without having to remove other components to gain access to the trouble spots. Shortage of spare parts and maintenance equipment at the Southeast Asian bases posed regular problems, but efficiency benefited from a system where groundcrew were assigned to individual squadrons, rather than being pooled for an entire wing as they would have been in the USA. A Southeast Asia-based RF-101 unit had around 280 enlisted men, of whom the majority completed full tours rather than short temporary duty assignments. They and the squadron's 23 officers flew or maintained 12 to 14 RF-101Cs (*USAF*)

high-G manoeuvring. Intense heat and humidity caused cameras and their associated equipment to fail on many occasions, and damage by hailstones during tropical storms grounded a number of RF-101Cs in 1967. Furthermore, the aircraft was not considered easy to service or repair. Maintenance personnel had to cope with an increasing level of restorative work as the aircraft aged with heavy utilisation, although there were only five operational losses of RF-101Cs during ten years of war compared with 38 combat losses.

In 1968 it was found that the potting compound used to insulate electrical connectors in RF-101Cs and other aircraft was melting in the high temperatures of Southeast Asia, leaving exposed wires that were in turn short circuiting. The US Marine Corps' F-4Bs were also susceptible to the problem, as they used similar components to those installed in the Voodoo. A long, messy repair session was needed by the 16-man team that was sent to clean up or replace the affected wiring.

The RF-101C's low-pressure fuel filters also tended to fail, causing fuel leaks, and its ARC-34 radio proved to be unreliable – nevertheless, pilots liked its digital display on the instrument panel. Generally, combat damage repairs and limits on engine temperatures to prolong the lives of the elderly J57s all reduced the Voodoo's performance and airframe life. In order to provide better recognition of the work done by its maintainers, the 45th TRS introduced a 'Voodoo Medicine Men' totem pole on which an individual crew chief's achievements in terms of scheduled missions flown, extra missions, returns from missions with no aircraft discrepancies and accuracy of maintenance records were recorded as points totals. At periodic 'commander's calls', the top crew chiefs (one for day and one for night operations per aircraft) received a prize of a three-day pass.

Maintenance was not aided by a late 1967 supply computer brainstorm that caused all RF-101C spares to be deleted from the records and shipped back to the USA! A six-month hiatus followed in which aircraft had to be cannibalised for parts while stocks were replaced.

Maj J Ketchum, a 45th TRS pilot, left Tan Son Nhut (in 56-0096) for a 7 July 1967 mission but his hydraulic systems began to drain out at 5000 ft, possibly due to small-arms fire from Viet Cong hiding near the

base or to mechanical failure. He jettisoned his drop tanks and headed back to the runway but both engines triggered fire warning lights and soon flamed, forcing Ketchum to eject – he was quickly picked up and returned to base.

Among the most tragic losses of the conflict were those caused by a mid-air collision in South Vietnam's overcrowded skies. On 9 August 1967, 45th TRS Voodoo 56-0225 hit a US Army UH-1D helicopter near Saigon and all four crew were killed, although the RF-101C pilot, Capt Jack Bond, managed to eject. Another mid-air occurred on 30 April 1969 – the same day that a Tan Son Nhut RF-4C was set on fire after being hit by AAA over the Ban Karai Pass. The crew managed to nurse the jet, with its precious photos, as far as Da Nang, but they were killed when the badly damaged Phantom II made an unsuccessful emergency landing and burned out. The two Voodoos involved in the mid-air on 30 April (56-0217 and 56-0168), one of which was being flown by an instructor, successfully landed at Phu Cat. Severe damage had been inflicted on the nose of one aircraft, while the other jet had to have its right wing, flap assembly and right engine jet pipe replaced. Both RF-101Cs were out of service for several weeks.

Another RF-101C survived a crash-landing after losing its utility hydraulics, flaps and left aileron control due to an AAA hit on 28 October 1969. In a high-speed landing, both main tyres blew out and the Voodoo veered off the runway, causing it to shed its right landing gear and damage the outer wing. The pilot was uninjured and repairs were made.

RF-101C 56-0120 had also survived an accident involving its undercarriage, although this had taken place on the other side of the world more than six years earlier. Taking off from Laon-Couvron on 3 May 1963 while serving with the 18th TRS on 3 May 1963, its left main wheel came off as pilot Capt Tom Saunders lifted the nose at 150 knots and the rest of the undercarriage was sheared away as the Voodoo skidded off the runway, hitting runway light mountings. Resurrected at St Louis, the scarred RF-101C was eventually reassigned to the 20th TRS and it met its end on 20 May 1967.

Maj Notley Gwynn Maddox was flying the jet that particular day, leading a two-ship reconnaissance flight to photograph a barracks near the MiG base at Kep. Negotiating intense seasonal thunderstorms as they headed north through the southern tip of North Vietnam, they approached the target at very low altitude on a devious, winding route to deceive the defences. However, once over Kep the pilots were met by intensive flak as they made their photo runs and Maddox contacted his wingman, Capt Ray Carlson, to say he had been hit. Carlson was still observing the target through his photo-viewfinder at the time, and when he looked out of the cockpit he was alarmed to see the sky filling with heavy AAA bursts as both Voodoos left the area.

When closing on the western end of the Haiphong Ridge of hills 16 miles southeast of Kep, Carlson lost contact with his flight lead. Maj Maddox was eventually declared killed in action. 'Red Crown', the radar control ship observing the mission, reported a MiG in the area, but there were no VPAF claims for a Voodoo shot down that day so it was assumed that AAA had fatally damaged Maddox's aircraft, causing it to crash near Tien Yen,

just short of the coast. Capt Carlson conjectured that Maddox's report of a hit might have referred to personal injury as much as aircraft damage.

The summer of 1967 brought two more SAM losses, with the one on 21 June 1967 being particularly unfortunate. Capt R E Patterson, in RF-101C 56-0085 from the 20th TRS, was flying at 30,000 ft over an SA-2 site when he saw a missile approaching, but he was unable to break its lock with the usual manoeuvres and his Voodoo sustained heavy damage. Unable to manoeuvre his ailing jet out towards the coast, Patterson had to continue heading north until he ejected near Yen Bai in mountainous country, from where he was quickly rescued by a USAF HH-3E helicopter. Five more missiles were fired at the SAR team's aircraft without further loss.

Reconnaissance of the SAM site the following day suggested that it was unoccupied, but when photographs taken on 18 June were re-examined, it was clear that it had indeed been occupied but the SA-2 crews had moved overnight to another site – a familiar NVA tactic to avoid detection and attack by *Wild Weasels*. However, the same photos showed that another site nearby did contain a SAM battalion. More thorough examination of these images (had there been time) before the 21 June mission might have saved Patterson's Voodoo.

The final loss to a SAM revealed the RF-101C's relatively ineffective ECM protection. Flying 20th TRS aircraft 56-0207 which was equipped with two Sanders AN/ALQ-51 deception jammers, Capt Charles Winston III was tasked with photographing a military storage area 20 miles from Hanoi on 1 August 1967. Extensively used by carrier-based US Navy fighters and bombers participating in Alpha strikes, the AN/ALQ-51 not only projected a false return of the aircraft to SAM or AAA radar operators, it could also detonate SA-2 fuses prematurely. It was relatively effective against the 'Fan Song B' guidance and tracking radar for the SA-2 and the 'Firecan' radars used by heavy-calibre AAA guns. When trialled in the RF-101C (which typically flew alone or, at most, in pairs), the AN/ALQ-51 was found to lack the power required to fool enemy radar systems. Furthermore, its deception function was largely offset by the gunners' tendency to fire extra rounds towards the general area of a single target aircraft. The jammers certainly gave Capt Winston little protection on 1 August, for a SAM blew the right wing off his Voodoo. It was assumed that he did not survive the impact of the missile, as no ejection attempt was seen.

The AN/ALQ-51 was immediately withdrawn, with the system being hastily replaced in all Voodoos in-theatre by the recently arrived AN/ALQ-71 *Compass Robin* ECM pod, up to four of which were being carried on high-risk missions from April 1967. Developed from the QRC-160-1 pod trialled earlier on RF-101Cs, the 1-8 GHz noise jammer pods were more robust but their 400-lb weight and drag equivalent to a drop-tank drag robbed the Voodoo of its speed advantage. This in turn meant that the aircraft had to have a fighter escort in areas where the MiG threat was evident. Normally, Voodoo pilots liked to make their photo runs at 500 knots, but with a Phantom II escort they had to throttle back to 450 knots or less so that the F-4s could keep up.

Capt Patterson was shot down for a second time on 16 September 1967. Maj Bobby Ray Bagley had left Udorn earlier that day to secure photos of

supply movements on the northwest railway in North Vietnam. With the pictures safely aboard, but probably slowed down by ECM pods, he headed for home. By then Bagley's Voodoo had been detected by VPAF radar, and two 921st Fighter Regiment MiG-21F-13s were scrambled from Noi Bai AB to intercept him. Nguyen Ngoc Do accelerated to Mach 1.4 behind the RF-101C (56-0180) and fired an R-3S missile that hit its target, giving the VPAF pilot ace status. Maj Bagley ejected from the crippled aircraft and was soon captured, being repeatedly tortured by NVA troops and villagers prior to being incarcerated in Hanoi. He had persuaded the USAF to let him leave a desk job in order to return to flying, and following his release in 1973, Bagley returned to Shaw AFB and eventually retired as a colonel.

Another Voodoo mission had to be mounted on the same day to take the photos that had been lost with Maj Bagley's jet, and Capt Patterson was given that task. His aircraft (56-0181) suffered substantial damage over the railway target area, with MiG-21 pilot Pham Thanh Ngan subsequently claiming that he had inflicted this. However, the USAF attributed the loss to AAA. Patterson managed to fly as far as Ban Ban in northern Laos before ejecting – a SAR helicopter again came to his rescue.

Although Bagley's aircraft was the only Voodoo ever downed by a MiG, it resulted in the withdrawal of RF-101Cs from most missions into the high threat areas of Route Package (RP) 6 in North Vietnam, which included Hanoi, Haiphong, Thai Nguyen and a handful of MiG bases.

The 20th TRS was replaced at Udorn on 28 October 1967 by the RF-4C-equipped 14th TRS, the latter immediately taking over one of the Voodoo unit's primary missions in 1967 – regular surveillance of the VPAF's jet-capable airfields. In March of that year 90 per cent of RF-101C missions had been flown in RP 6, with pilots very often being tasked with searching for multiple targets. At that point the Voodoo was the platform of choice for such sorties, rather than the RF-4C. Their operations over Laos, southern North Vietnam and South Vietnam also provided the RF-101C units with a very heavy workload, and the RF-4Cs had to shoulder the burden of RP 6 after Voodoo operations were wound down. The Tan Son Nhut RF-101Cs, with their preferred KA-1 camera imagery, continued to fly missions into less well defended areas of North Vietnam, however, supplementing the comparatively small numbers of RF-4Cs then in-theatre and placing less demand on the tanker force due to the Voodoo's longer unrefuelled range.

As part of the *Have Doughnut*/*Have Idea* project, a variety of tactical aircraft from both the USAF and US Navy were flown against MiG-17s and MiG-21s at the secret Groom Lake establishment in Nevada. A single mock combat between a MiG-21F-13 and an RF-101C in March 1968 showed that the two aircraft had very similar speed and acceleration characteristics, although the Voodoo handled better when accelerating above 530 knots. A steep descent with full acceleration and judicious manoeuvring to avoid heat-seeking missiles was found to be the best escape tactic for RF-101 pilots, although many had already worked that out for themselves by then. In the same trials the RF-4C was found to have better overall acceleration, better internal ECM (including a chaff dispenser to break the radar lock of an enemy fighter) and a rear seat crewman to help in

locating MiGs. These demonstrations reinforced the decision to withdraw RF-101Cs from high-threat areas.

Shortly before the removal of its North Vietnam mission responsibility, the 460th TRW was allowed to experiment with the use of other bases in South Vietnam to shorten the delivery time for photographs to the many US Army units in the country. In August 1967 preparations were made to establish a 45th TRS detachment at Phu Cat AB, some 400 miles northeast of Saigon, using 17 WS-430B air-transportable PPIF vans. The detachment was operational by 3 September as Forward Operating Location Alpha. Voodoo pilots launched from Tan Son Nhut and landed at Phu Cat, where their film footage was immediately processed. The aircraft were duly refuelled, re-loaded with film and sent on a second sortie before returning to Tan Son Nhut. Although re-supplying the Phu Cat operation required considerable logistical effort, there were advantages, and its PPIF remained open until October 1969.

On an 11 September 1967 low-altitude sortie an RF-101C's KA-1 cameras revealed numerous NVA artillery pieces that had been blasting US Marine Corps positions from gun emplacements around the DMZ. The well-camouflaged guns had not shown up on previous medium-altitude RF-4C photography. The RF-101Cs continued to record details of the NVA artillery in Operation *Neutralize* until the end of October, although it was not possible to confirm that any of the guns had been taken out by retaliatory US Marine Corps and USAF air strikes. A similar operation, called *Foxtrot*, was conducted in September 1968 to identify heavy artillery that was pounding US troops just south of the DMZ. Despite thorough KA-1 coverage, the NVA succeeded in disguising all but four of their artillery pieces from the prying cameras of US 'tac recon'.

The persistence of the NVA in expanding and maintaining its Ho Chi Minh Trail network as a diverse route for untold quantities of supplies to insurgents in South Vietnam was also a source of constant frustration to US strategists. An elaborate infiltration surveillance centre was designed at Eglin AFB and constructed at Nakhon Phanom RTAFB. Its purpose was to collect data from airborne and other sources, evaluate it and integrate it with other data before authorising air strikes. One of the main sources of intelligence was still the RF-101C, together with imagery from RF-4Cs and slower-moving piston-engined observation aircraft. The Phantom II's infra-red imaging found limited use over South Vietnam, while its photoflash and AN/APQ-102 side-looking radar capability had some uses over North Vietnam.

Amongst the more elaborate attempts to track movement on the trails when darkness and bad weather disguised most of the human and mechanical traffic was the *Muscle Shoals* programme, initiated in September 1966. The programme, which developed into *Igloo White* in June 1968, was an attempt to establish an electronic 'wall' across much of Laos and South Vietnam. It involved the placing of thousands of air-dropped acoustic and seismic sensors to detect the movement of wheels or feet and transmit the resulting signals to orbiting aircraft above the area, which would then report to the Nakhon Phanom operations centre. The latter could duly call in immediate air strikes against these elusive targets. In fact,

this was seldom carried out as commanders were not prepared to trust the sensor data unless it was supported by celluloid imagery.

Effective location of the sensors was crucial, and RF-101C imagery via KA-1 cameras at around 400 ft was the most useful reference material for locating appropriate placements. Up to 31 October 1967, the RF-101C units flew more than 40 missions for this project. They also had to photograph the exact position of each sensor as it was dropped and, in many cases, regularly re-photograph the location areas, as well as identifying new ones. By the end of 1967 this task involved most of the RF-101C force, which flew up to five missions daily in support of the 'electronic barrier', although the transport targets were often long gone by the time the photographic evidence had been used to generate a strike mission.

SLOW DIMINUENDO

The decline in RF-101C numbers and the delivery of the final replacement aircraft from PACAF reserves in July 1967 necessitated the deactivation of the 20th TRS at Udorn on 31 October that same year. Most of its assets were combined with the 45th TRS's at Tan Son Nhut to allow missions to continue over South Vietnam and the southern areas of Laos.

The last Udorn loss was suffered on 18 October when Maj Nick Pishvanov was running a Ho Chi Minh Trail mission over southern Laos in 56-0212. Flying at 500 ft and 480 knots, his Voodoo took a hit that disabled the tailplane controls. Pishvanov ejected seconds before the aircraft crashed and he was able to guide a SAR helicopter in to pull him from the jungle. Quickly returned to Udorn, Pishvanov gave a detailed visual report on the gun emplacements that he had photographed, allowing a successful air strike to be mounted that destroyed large quantities of ammunition stored in this location.

Pilots from the 'Polka Dots' continued to fly sorties at a taxing pace, and the NVA's siege of the US Marine Corps outpost at Khe Sanh, combined with the Tet Offensive of 31 January 1968, only added to the mission tempo. Their high-definition photographs were very helpful in identifying enemy trench lines and gun emplacements in the immediate vicinity of Khe Sanh for tactical aircraft to attack. Although three more replacement Voodoos were shipped out from Shaw AFB in 1969 for Southeast Asian use, supply could not keep pace with the attrition rate. RF-101Cs made many photo runs across the embattled base and its surroundings, providing Gen Westmoreland's staff with high-quality imagery of the enemy positions and a retreating army division that had suffered heavy casualties. During a 90-day period in support of the confrontation at Khe Sanh almost 1400 reconnaissance sorties were flown and USAF cameras exposed nearly one million feet of film.

The reconnaissance workload was massively increased in January by the simultaneous Viet Cong attacks on Saigon and five other South Vietnamese cities, which were part of a general offensive by some of the 80,000 North Vietnamese-sponsored troops in South Vietnam.

The 45th TRS had to achieve a high sortie rate despite two guerrilla attacks on US air base flightlines. Attacks on airfields from 29 January

Technicians try to salvage anything useful from the camera bays of RF-101C-45-MC 56-0182, which was destroyed in its revetment at Tan Son Nhut by the Viet Cong's 122 mm rockets and 75 mm recoilless rifles on the night of 17 February 1968. It was the only RF-101C to be lost in this way, although others were damaged in similar attacks (*Capt Paul Subbie Collection*)

to 2 February 1968 with crude 122 mm rocket projectiles and mortar rounds destroyed 16 aircraft and damaged 42. The 45th TRS at Tan Son Nhut sustained minor damage to several Voodoos, although steel revetments saved many others. Fortunately, much of the enemy ordnance expended failed to explode. A more concerted attack on the base on 17/18 February with 122 mm rocket projectiles and 75 mm mortar rounds destroyed a C-130B, an RF-4C and RF-101C 56-0182 – eight other Voodoos suffered minor damage. The communist insurgents escaped unscathed. For some time afterwards the 45th TRS mission schedule included surveillance of potential rocket and mortar launch sites around Saigon in the hope of catching the elusive night-time attackers.

With several thousand South Vietnamese in employment at Tan Son Nhut, security was always a thorny problem, including the apparent ease with which the Viet Cong received advance warning of B-52 strikes, which were planned at the base's Seventh Air Force HQ.

RF-101Cs sometimes identified signs of enemy activity around the base during Tet. On 1 February Voodoos flew 21 missions, covering an area within eight miles of Tan Son Nhut and beginning their photo runs just moments after take-off. Their cameras revealed storage bunkers, foxholes and 23 mm gun emplacements. This extra workload required 35 new PIs to analyse the 180,000 ft of film exposed by the end of April. Pilots also made photo runs over Saigon upon returning from a mission if they still had sufficient fuel and film to do so. With flaps down at 200 knots and flying at an altitude of around 7000 ft, their KA-1s provided highly detailed images of the city to assist in detecting potential trouble spots.

A further enemy assault on 5 May was a well-planned series of mortar and rocket attacks throughout the south and, like the Tet Offensive, it took the defenders by surprise. The 45th TRS began moving its Voodoos from Tan Son Nhut to Phu Cat (an F-100 base) overnight to avoid the regular rocket barrages until the NVA arranged an ambush of the Phu Cat 'refugees' too on 11 May. Two were damaged on the ground, after which the overnight escape flights were then suspended. Fearful of a full-scale attack on Saigon, ground commanders asked for a photo-mosaic of the surrounding areas by RF-101Cs. Yet despite constant observation from the air, and frequent air strikes, Viet Cong sappers managed to make numerous attacks on US facilities. Better protection came from the steel and concrete 'wonder arch' shelters that were built at many US bases. Film technician Doug Ayers endured a number of these attacks in 1968;

'Viet Cong sappers were successful in getting some action onto Phu Cat in 1968 but damage was "so-so", even though it was a fairly easy target because of its location and openness. It was fairly safe though due to the location of the South Korean Army's 5th Tiger Division firebase just outside our living quarters – its 175 mm howitzers seemed to be shooting constantly. I

remember the most damage sustained by my first PPIF in Vietnam was when the US Army tried to steal an MB15 generator unit with a Flying Crane helicopter, which would have worked except for the fact the MB15 was still hooked up through the control box to the PPIF vans!'

BUSINESS AS USUAL

Despite the reduction in the RF-101C force and President Johnson's announcement that bombing of North Vietnam would be 'paused' on 1 April 1968, the Voodoo crews' main task continued to be trails reconnaissance and the production of high-definition KA-1 photography that would sometimes enable NVA troop and supply movements to be intercepted. Ground commanders always wanted more KA-1 prints than the photo labs could supply. New roads in the notorious A Shau Valley area allowed lorry movements in monsoon conditions, and US Army and Special Forces ground campaigns such as Operations *Grand Canyon* and *Buffalo* were organised to try and interdict the ever-expanding, well-camouflaged route network.

Visual confirmation of all targets was required before any could be bombed, and the RF-101C was still the best means of collecting that information. Low altitude approaches at 100 ft could sniff out camouflaged armour, and Maj Luster Vickrey of the 45th TRS was one of the pilots to receive a Silver Star for just such a mission flown on 28 September 1967. The trails were heavily defended, however, with numerous well-camouflaged 37 mm guns often posing the worst threat. Effective up to an altitude of 10,000 ft, they were hidden in the valley walls and floor, awaiting strike, reconnaissance or FAC aircraft.

President Johnson's bombing pause in March 1968 made no difference to the 45th TRS's workload and it only increased the dangers for pilots as they continued their missions just north of the DMZ. As the North Vietnamese now considered themselves safe from attack, the number of AAA and SA-2 sites surrounding Hanoi dramatically increased (monitored closely by U-2, Ryan drone and SR-71 reconnaissance). Protection for the Laotian supply routes was also improved, and the NVA did not hesitate to use heavy-calibre AAA against reconnaissance aircraft.

Maj Giles Harlow's RF-101C 56-0215 became the last of 28 combat casualties for the Voodoo community over North Vietnam when it was hit by AAA on a second pass over a possible target ten miles north of the DMZ on 6 August 1968. Hydraulic pressure fell rapidly, the aircraft caught fire and Harlow turned out to sea as the cockpit filled with smoke. Crossing the coast, the jet began to pitch down suddenly and the controls froze as the hydraulic systems drained out. Harlow ejected under negative-g at 20,000 ft near Hue, and he was soon rescued by the US Navy.

Voodoos continued to monitor the trails with their KA-1s in Operation *Turnpike* right up to 25 June 1968, and they repeatedly returned with small-arms damage. At the expense of their revealing low-altitude photographs, pilots were told to stay above 3000 ft in areas where known troop concentrations could fire curtains of bullets ahead of a photo pass. They were reminded too of the 'one pass, haul ass' motto that discouraged them from returning to examine a suspect site more carefully. Area coverage was also restricted to three 'lines' over territory where mosaic images were

RF-101C-45-MC 56-0176, wearing *KATHY'S CLOWN* titling and artwork, heads for the South Vietnamese coastline during a flight from Tan Son Nhut in 1969 (*USAF*)

The three Purple Heart awards added to the artwork on 56-0176 represented hits from ground fire during a mission over the notorious A Shau Valley on 4 January 1969. Previously known as *KATHY'S CLOWN* when flown by Capt Kirby A Bernich, this 45th TRS RF-101C was transferred to the Mississippi ANG upon returning to the USA in 1970 (*Terry Panopalis Collection*)

needed. It was necessary to photograph much-used choke points or narrow sections of the Mu Gia or Ban Karai passes daily or even more frequently, making visits by Voodoos very predictable for the ground defences. When a section of road was bombed to hold back the tide of trucks, regular photo runs were needed to assess how fast the NVA carried out repairs and resumed their convoys.

President Johnson ordered a complete bombing halt over North Vietnam from 31 October 1968, but reconnaissance flights continued with grudging permission from Hanoi. RF-4Cs and RF-101Cs made tentative sorties north of the DMZ, although daytime Voodoo missions were very limited. By the end of that year the 45th TRS began to focus on trails movements in the A Shau Valley in South Vietnam, which had become a main supply route despite frequent air attacks. Although Project *Mac See*, involving RF-101Cs and RF-4Cs, had to be flown above 2500 ft so as to avoid small-arms fire, the imagery taken produced crystal-clear evidence of a constant stream of traffic heading for South Vietnam in preparation for another major attempt at taking over the country. For nine days in January and early February 1969, a pair of Voodoos flew over the heavy traffic and delivered their film to Udorn before being reloaded to make a return trip to Tan Son Nhut, taking more photos en route.

PACAF insisted on a minimum altitude of 15,000 ft for missions over the southern tip of North Vietnam, from which good KA-1 photography was still possible. From mid-1969 fighter escort accompanied missions near the North Vietnamese border as MiG sightings increased. A verbal agreement with Hanoi that US reconnaissance flights would not be fired upon was soon broken when RF-4Cs were hit. Operation *Search* from February to April 1969 pitted RF-4Cs and RF-101Cs against the heavy AAA established in the Mu Gia Pass. In high-speed runs at 500 ft, they observed copious road traffic and identified more than 150 targets.

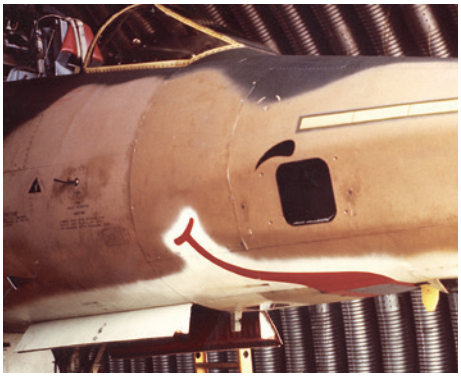
Later in 1969, as President Richard Nixon's draw-down of US forces in Vietnam approached, the RF-101C operation was once again focused on Tan Son Nhut. The last mission from Phu Cat was flown on 14 October 1969, after which the detachment and its processing equipment were moved back to Tan Son Nhut. In-flight refuelling missions were also reduced and gradual shrinkage of the RF-101C pilot cadre began. However, the aircraft's KA-1s still offered valuable capability to army commanders, and it was heavily engaged in the big *Commando Hunt III* operation that began in Laos in October 1969.

Large format photographs were the best means of assessing the degree of damage inflicted on trucks and river-borne traffic, although the success of the reconnaissance flights was routinely compromised by poor monsoon weather. Often, the Voodoo pilots would be asked to remain on station while a strike flight dropped its ordnance, and then secure photos of damaged vehicles or other targets before the North Vietnamese could drag them under cover. This was also done early in the morning after convoys had been attacked at night by fighter-bombers or gunships using flares or infra-red targeting. From April 1970 this tactic was replaced by the use of a single RF-101C on alert for high-priority tasks.

The previous month, the 16th TRS had moved its AE-coded RF-4Cs from Tan Son Nhut to Misawa AB to join the 475th TFW, leaving an increased workload for the AH-coded RF-101Cs of the 45th's Det 1 and the 12th TRS, whose AC-coded RF-4Cs remained at Tan Son Nhut until August 1971. Voodoos from the 45th TRS flew daily sorties over North Vietnam below the 17th parallel, braving increasing numbers of mobile SA-2 launchers and AAA positions along Route 7 and in the Mu Gia and Ban Karai passes as the North Vietnamese moved their defensible border steadily southwards. MiG-21s also began to extend their patrol areas further south. RF-101 pilots were allowed to fly below 500 ft to improve their chances of survival against these threats, but a consequent increase in light AAA weapons in the Voodoos' favourite target areas soon prompted a return to a 4500-ft ceiling.

President Nixon's decision to act against the insurgents' supply dumps and sanctuaries in Cambodia along the border with South Vietnam added another task for the 45th TRS, which still continued its work over southern North Vietnam. American-led troop movement into the Cambodian border area was preceded by 14 months of nocturnal *Arc Light* B-52 attacks in Operation *Menu*. The extreme secrecy of the planned incursion ruled out photo-reconnaissance by RF-101Cs or RF-4Cs because it was felt that the film would pass through so many hands during processing and interpretation that security could be compromised. Intensive reconnaissance that should have preceded a troop movement into Cambodia was therefore ruled out for fear of signalling US intentions. High-altitude U-2 photography showed little more than the jungle canopy, and the most useful intelligence came from pilots of low-flying observation aircraft.

When the ground operation began in April 1970, reconnaissance flights coded *Face Value* took Tan Son Nhut's Voodoos and RF-4Cs up to 60 nautical miles into Cambodian airspace, revealing a massive build-up of Khmer Rouge troops and cargo on routes and waterways leading to major settlements in Cambodia, including the capital Phnom Penh. Reconnaissance flights had to venture well beyond the 30 km incursion limit agreed with the Cambodian government, although the RoE denied them fighter escort. Once again, the KA-1 imagery proved to be the most useful method of revealing the details of enemy activity, particularly on waterways. Aircraft from the 45th TRS were often flying two sorties a day during their final months.



A traditional 'sharksmouth' marking would have been inappropriate for the RF-101C's 'alone, unarmed and unafraid' mission, but this variation (seen on a 45th TRS aircraft in June 1970) was a suitable response to the 'sharkmouthed' Korat-based Phantom II fighters that performed escort duties for reconnaissance flights by this late stage in the war (*Terry Panopalis Collection*)

Slightly more official-looking nose-art appeared on 45th TRS RF-101C-60-MC 56-0228 in June 1970. By then, RF-4Cs were gradually replacing the 45th TRS's Voodoos, offering more effective ECM protection against SAMs and radar-directed AAA and the crucial advantage of night reconnaissance capability using infra-red and sideways-looking radar imaging. The Phantom II's AN/APQ-99 radar provided effective navigation and terrain following modes and inertial navigation was a considerable advance. Although pilots of single-seat Voodoos valued their solo command of the mission, including navigation and camera operation, the second crew member in an RF-4C could lighten the workload and provide a useful second pair of eyes (*Terry Panopalis Collection*)

MISSY ANN was RF-101C-55-MC 56-0211 from the 45th TRS, formerly flown by the 66th and 363rd TRWs and operated post-war by the Mississippi ANG (*Terry Panopalis Collection*)

In the summer of 1970 the 460th TRW experimented with a joint operation involving RF-101Cs and aged EC-47s that were equipped to locate enemy radio transmitters in southern Laos. When a transmitter was found, the RF-101C would be called in to photograph the site so that it could be targeted. In practice, the sites were so well camouflaged that a radio 'fix' provided the most accurate clues to their location, and some were subjected to devastating B-52 *Arc Light* attacks.

The Voodoo's big cameras were missed when the decision finally came to close down Det 1 and the RF-101C training squadrons (the 31st TRTS and 29th TRS) at Shaw AFB, which would both switch to preparing ANG RF-101A/C crews to take over the remaining reconnaissance Voodoos before their own inactivation early in 1971. Aircraft from the 29th TRS gradually passed to the 127th TRG of the Michigan ANG at Selfridge Field, replacing RF-84Fs, and they were joined there by the 13 remaining RF-101As of the 31st TRTS, a 'present' for the 191st TRG also at Selfridge Field. The 18th TRS was still based at Shaw as the last operational RF-101C unit without Southeast Asian responsibilities, although it too began transition to the RF-4C in October 1970, transferring its Voodoos to the 189th TRG of Arkansas ANG – the latter unit had been flying RF-101Gs since 1965.

Congressional pressure to reduce war-related spending was the main motivation to remove from combat an aircraft that still had some unique capabilities to offer despite its diminished numbers and a combat record of more than 35,000 sorties, almost a third of them over North Vietnam.

The 45th TRS flew its final missions on 1 November 1970, having completed 194 during the course of that year. The last 16 RF-101Cs left Tan Son Nhut on 16 November for service with the 153rd TRS of the Mississippi ANG at Key Field, Meridian, where they replaced long-serving RF-84Fs. They remained with the squadron until January 1979, when RF-4Cs took over. With the departure of the Voodoos from South Vietnam, the 'Polka Dots' were left without a role and faced deactivation. RB-57 flights had ended three months earlier, with one aircraft having accumulated more than 8000 flying hours, and the RF-4C component was reduced to one Udorn-based unit, leading to the inactivation of the 460th TRW (under Col Jerome F O'Malley) on 31 August 1971.

RF-101C-70-MC 56-0105 *THE IRON EYEBALL* also served with the 45th TRS in 1970. An earlier version of the name was presented in diagonal lines of white script prior to the unit adopting this circular style of lettering. RF-101C pilots served 12-month tours, although they could finish them early when they reached 100 missions. Fifty-five RF-101 pilots from the 20th TRS completed 100-mission tours out of a total of 6200 missions flown by the unit over North Vietnam. Among the Voodoo pilots' tasks were attempts to acquire BDA for B-52 *Arc Light* attacks on jungle targets, but the forest often disguised the results (*Terry Panopalis Collection*)

As North Vietnamese reaction to reconnaissance flights grew increasingly hostile in December, the single RF-4C unit at Udorn became severely overworked – a situation that worsened when the NVA launched its three-frontal attack on South Vietnam in February 1972. Although the 432nd TRW at Udorn was deactivated on 19 March 1973, reconnaissance continued over Cambodia until the official end of USAF operations on 15 August 1973, bringing the total of USAF tactical reconnaissance flights since 1961 to no less than 650,000 sorties.

CHAPTER SIX

VARIOUS VOODOOS

Low-intensity formation strip lights (or 'slime lights') were added to most F-101 Voodoo variants in the late 1960s, including some of the 45th TRS aircraft at Tan Son Nhut. They stand out on the rather worn camouflage of RF-101C-60-MC 56-0224, a former 66th TRW aircraft serving here with the 154th TRS of the Arkansas ANG in 1974 (*USAF*)

The return of the surviving RF-101Cs from Vietnam and the realisation that they had been a vital but relatively scarce weapon in that war coincided with a desire to enhance and expand TAC's reconnaissance force. RF-4Cs were expensive, and although 505 had been bought (compared with 166 RF-101Cs), the last production batches of 24 were financed with 1971/72 budget requests and no more were scheduled. By then only 14 RF-101As remained in use.

McDonnell had already produced a partial solution with its programme of conversion of low-hours, surplus F-101A/C airframes whose nuclear strike role had been short-lived. From 1965, 21 F-101As became RF-101Gs after their radar, guns and fire control systems were replaced by forward- and sideways-angled cameras in a blunter nose section. Thirty-one surviving F-101Cs from the 81st TFW were reborn and similarly re-equipped as RF-101Hs, and both variants provided up to ten years of ANG service from 1965 onwards. Most of the conversion work was undertaken by Lockheed, with additional work performed at McClellan AFB, California. These 'new' reconnaissance Voodoos provided a potential back-up to the declining RF-101C force as the Vietnam War took its toll.

The RF-101G/Hs gave useful service. Although they were not converted in time to respond to the North Korean seizure of the surveillance vessel USS *Pueblo* (AGER-2) in January 1968 as President Johnson had hoped when he activated the ANG's three reconnaissance units, they all deployed

Conversion of F-101A/C fighters into RF-101G/H reconnaissance aircraft required minimal changes to the airframe but a total refit of the internal nose area. The Arkansas ANG began to receive RF-101Gs in 1965, and the small batch of 27 converted airframes was joined by 33 RF-101Hs that flew with units assigned to the Kentucky and Nevada ANGs, where they replaced RB-57A/B Canberras. The 154th TRS aircraft of the Arkansas ANG, whose RF-101Gs are seen here, deployed to Itazuke AB at that time (*USAF*)

to the Far East later that year. Twenty Arkansas ANG RF-101Gs flew to Itazuke in June, and they were relieved by RF-101Hs from the Nevada ANG's 192nd TRS in November. Aircraft from both units flew many reconnaissance missions over the area, including some from bases in South Korea. The Kentucky ANG 123rd TRW took over the Itazuke duty from January to April 1969 and received an Outstanding Unit Award for its performance with the RF-101G during the wing's active duty period, which had also included a deployment to Howard AB, Panama, and five months at Elmendorf AFB, Alaska, in connection with the *Pueblo* Crisis.

Following a 1968 proposal, the Voodoo conversion programme, managed in this case by Ling-Temco-Vought, also processed 22 ex-Royal Canadian Air Force two-seat interceptor CF-101Bs as RF-101Bs. These aircraft had flying boom or drogue refuelling and similar reconnaissance equipment to the single-seat conversions in order to expand the much reduced RF-101C force. As two-seaters, they would also serve as trainers for all the second-generation photo-Voodoos.

A somewhat crude Martin Marietta-designed box fairing beneath the nose contained three KS-87B cameras, with one looking forward and two as left and right split vertical units, together with a KA-56B vertical panoramic. Also, two AN/AXQ-2 TV cameras could be mounted in the forward oblique and vertical positions. The rotating under-fuselage door that launched Genie air-to-air missiles became a platform for equipment for the navigation systems and a TV viewfinder was located in the cockpit, with a manual or automatic camera control panel on the pilot's left console. The camera suite was supposed to operate effectively from altitudes of 250 ft at 600 knots.

Much-travelled F-101B-115-MC 59-0398 served with Nos 410 and 425 Sqns of the Royal Canadian Air Force from January 1962 until it was returned to the USAF and placed in storage in January 1971. The following year the fighter was converted into an RF-101B and issued to the 192nd TRS of the Nevada ANG. It was returned to storage at the MASDC in July 1975 and salvaged in January 1980 (*USAF*)

F-101B 57-301 served as the prototype RF-101B, and conversion work on 22 more took place between September 1971 and January 1972. They were delivered to the 152nd TRG (to which the 192nd TRS was assigned) of the Nevada ANG to replace its RF-101Hs, but they proved to be costly in service and less effective in the reconnaissance role than single-seat RF-101s. Most were redistributed to other ANG F-101B fighter units as training airframes, their brief service career ending in August 1975.

VOODOO SHUFFLE

In October 1971, with all surviving RF-101B/Cs and the conversions from fighter versions included, the ANG's reconnaissance units could muster more than 130 RF-101s of various sub-types. In the summer of the following year the USAF decided to re-equip the Michigan ANG's 127th TRG and the 189th TRG from the Arkansas ANG with F-100D Super Sabres. The latter unit passed its RF-101Cs to the co-located 189th TRG, while the 127th TRG's aircraft went to Kentucky for the 123rd TRG. Furthermore, the Michigan ANG's 191st TRG relinquished its RF-101As and became the 191st FIG, flying F-106A Delta Darts with ADC from summer 1972.

154th TRS RF-101G 54-1473 had formerly been an F-101A 35 MC that served with the 81st TFW at RAF Woodbridge/Bentwaters. The RF-101G/H conversion included a KA-56 panoramic camera under the nose and four windows for KS-87 framing cameras in various split vertical configurations. The nose radome slid forward or could be completely removed for access to the forward oblique camera installation (*USAF*)

The surplus RF-101Cs now made available due to the delivery of F-100Ds allowed the dedicated photo-reconnaissance Voodoo variant to replace the RF-101G/H conversions. The 123rd TRG duly began to send its RF-101Hs to the Military Aircraft Storage and Disposition Center (MASDC) at Davis-Monthan AFB, Arizona, from March 1972, followed in May by the Arkansas ANG's RF-101G contingent and the timed-out RF-101As from the 191st TRG, which were all lined up in the Arizona desert by mid-June 1972. By August of that year the ANG reconnaissance groups had standardised as three RF-101C operators and one with the box-nosed RF-101B.

As previously noted, the unpopular RF-101Bs enjoyed only a brief career with the ANG. By January 1975 they too had begun to arrive at MASDC for storage as the Nevada Guardsmen gave up their aircraft, together with the ANG fighter-interceptor units that had used a few as trainers. That same year the ANG began to receive RF-4Cs when the 123rd TRG of the Kentucky ANG started to send its RF-101Cs to Davis-Monthan as more Phantom IIs arrived at Louisville International Airport. The Nevada ANG's 152nd TRG began receiving its RF-4Cs in July 1975. At Little Rock, Arkansas, the 189th TRG gave up its RF-101Cs and became a tanker unit in 1976. Meanwhile, the ex-45th TRS aircraft with their extra Vietnam theatre equipment continued to fly with the 186th TRG of the Mississippi ANG until it too began to receive RF-4Cs at the end of 1978. The group's last two Voodoos were sent to Davis-Monthan for storage on 12 January 1979, thus ending the RF-101's 22 years of distinguished service. As Capt Paul Subbie put it, 'Long live the memory of the One-O-Wonder'.

RF-101As, including 54-1510, remained in use with the 31st TRTS at Shaw AFB in 1970. When the unit completed its task of training pilots for the 45th TRS at Tan Son Nhut, it transferred its remaining aircraft to the 91st TRG of the Michigan ANG. Thirteen RF-101As made the final flypast at Shaw on 16 February 1971 (*Terry Panopalis Collection*)

APPENDICES

RF-101A/C Combat and Operational Losses

(Thirty of the 166 RF-101Cs built had been lost in operational accidents prior to combat entry)

Combat Losses

SERIAL	UNIT	DATE	LOCATION	PILOT	CAUSE
54-1498	4th CRS (RoCAF)	2/8/61	Fuzhou, China	Maj Wu Pao-tze	AAA
54-1519	4th CRS (RoCAF)	18/3/65	Taiwan Strait	Lt Col Chang Yu-Pao (KIA)	MiG-19
56-0040	15th TRS/18th TFW	29/6/65	Son La, North Vietnam	Capt Marvin N Lindsey (MIA)	ground fire
56-0043	45th TRS/39th AD	7/3/66	Xuom Gia, North Vietnam	Capt Jerdy A Wright (KIA)	SAM?
56-0045	45th TRS/39th AD	6/5/65	Vin Linh, North Vietnam	Capt Robert A Stubberfield (KIA)	AAA
56-0051	20th TRS/460th TRW	6/7/66	Phieng Hong, Laos	Maj James F Young (PoW)	AAA
56-0056	20th TRS/460th TRW	12/8/66	Nam Dinh, North Vietnam	Maj Blair C Wrye (KIA)	AAA
56-0064	20th TRS/460th TRW	7/8/66	Tan Son Nhut, South Vietnam	Maj Don Dyer (rescued)	hit ground
56-0066	45th TRS/39th AD	21/3/66	Hon Me, North Vietnam	Capt Arthur W Burer (PoW)	ground fire
56-0067	45th TRS/39th AD	29/7/65	Yen Bai, North Vietnam	Capt Jack W Weatherby (KIA)	AAA
56-0075	45th TRS/39rd AD	3/4/65	Phu Van, North Vietnam	Capt Herschel S Morgan (PoW)	AAA
56-0084	20th TRS/6250th CSG	26/1/66	Xuan Son, North Vietnam	Capt Wilber N Grubb (PoW died)	ground fire
56-0085	20th TRS/432nd TRW	21/6/67	Yen Bai, North Vietnam	Capt Robert E Patterson (rescued)	SAM
56-0090	20th TRS/460th TRW	22/4/66	Ca Nung, North Vietnam	Maj Alan L Brunstrom (PoW)	ground fire
56-0093	20th TRS/432nd TRW	4/11/66	Hoang Xa, North Vietnam	Capt Vincent J Connolly (KIA)	SAM
56-0096	45th TRS/460th TRW	7/7/67	Tan Son Nhut, South Vietnam	Maj J Ketchum (rescued)	ground fire
56-0120	20th TRS/432nd TRW	20/5/67	Kep, North Vietnam	Maj Notley G Maddox (KIA)	AAA
56-0165	20th TRS/432nd TRW	5/12/66	Yen Bai, North Vietnam	Capt Arthur L Warren (KIA)	SAM
56-0172	45th TRS/39th AD	2/4/66	Xom Duong Quan, North Vietnam	Capt Daniel J Doughty (PoW)	AAA
56-0174	15th TRS/18th TFW	1/11/65	Dao Cat Ba, North Vietnam	Capt Norman P Huggins (rescued)	ground fire
56-0175	45th TRS/460th TRW	3/11/66	DMZ, North Vietnam	Capt Dennis J Haney (rescued)	ground fire
56-0178	15th TRS/18th TFW	5/10/65	Kep, North Vietnam	Capt Robert W Pitts (survived)	AAA
56-0180	20th TRS/432nd TRW	16/9/67	Son La, North Vietnam	Maj Bob R Bagley (PoW)	MIG-21
56-0181	20th TRS/432nd TRW	16/9/67	Ban Ban, Laos	Capt Robert E Patterson (rescued)	MiG-21 or AAA
56-0186	20th TRS/363rd TFW	13/8/65	Van Yen, North Vietnam	Capt Frederic M Mellor (KIA)	ground fire
56-0190	15th TRS/18th TFW	29/4/65	Sam Neua, Laos	Capt Charles E Shelton (PoW/KIA)	ground fire
56-0203	45th TRS/460th TRW	8/2/67	Dong Hoi, North Vietnam	Capt John H Rogers Jr (rescued)	AAA
56-0204	15th TRS/18th TFW	27/9/65	Nam Dinh, North Vietnam	Capt George R Hall (PoW)	AAA
56-0207	20th TRS/432nd TRW	1/8/67	Vinh Yen, North Vietnam	Capt Charles C Winston (KIA)	SAM
56-0212	20th TRS/432nd TRW	18/10/67	southern Laos	Maj Nicholas A Pishvanov (rescued)	ground fire
56-0215	45th TRS/460th TRW	6/8/68	Thach Ban, North Vietnam	Maj Giles D Harlow (rescued)	AAA
56-0218	20th TRS/460th TRW	29/4/66	Yen Bai, North Vietnam	Maj Alan R Runyan (PoW)	ground fire
56-0220	45th TRS/39th AD	7/3/66	Xuam Gia, North Vietnam	Capt Gordon L Page (KIA)	SAM?
56-0226	20th TRS/460th TRW	31/7/66	Bac Ninh, North Vietnam	Maj William D Burroughs (PoW)	AAA
56-0230	15th TRS/18th TFW	21/11/64	Ban Phan Nop, Laos	Capt Burton L Waltz (rescued)	AAA

Operational Losses

SERIAL	UNIT	DATE	LOCATION	PILOT	CAUSE
56-0049	?	26/7/67	?	? (survived)	mechanical failure
56-0063	20th TRS/432nd TRW	12/3/67	Udorn, Thailand	Maj Don Miller (survived)	pitch-up on landing
56-0064	20th TRS/460th TRW	7/8/66	Tan Son Nhut, South Vietnam	Maj Don D Dyer (survived)	aquaplaned on landing
56-0079	20th TRS/18th TFW	1/7/65	Ubon, Thailand	Lt Col Raymond A Lowery (survived)	rudder lock
56-0086	20th TRS/460th TRW	13/3/66	Udorn, Thailand	? (survived)	pitch-up on landing
56-0182	45th TRS/460th TRW	17/2/68	Tan Son Nhut, South Vietnam	-	Viet Cong rocket attack
56-0201	20th TRS/460th TFW	26/7/66	Udorn, Thailand	? (survived)	pitch-up on landing
56-0225	45th TRS/460th TRW	9/8/67	near Saigon, South Vietnam	Capt Jack Bond (survived)	mid-air collision with US Army UH-1
56-****	45th TRS/460th TRW	7/8/67	Tan Son Nhut, South Vietnam	? (survived)	hydraulic failure
56-****	45th TRS/460th TRW	9/3/68	North Vietnam	Maj Art Beckstrom (survived)	written off after suffering severe AAA damage

COLOUR PLATES

1
RF-101C-40-MC 56-0170 of the 363rd TRW, Operation *Blue Bat* Composite Air Strike Force, Incirlik AB, Turkey, August 1958

Six RF-101As, led by Capt Ray Schrecengost Jr in 54-1515, were deployed from Shaw AFB to Incirlik until mid-October 1958 to support the Lebanese government following political unrest in the country. This aircraft, depicted here in the original bare-metal scheme with basic markings, was destroyed in a crash near Elmendorf AFB, Alaska, on 15 March 1963.

2
RF-101C-50-MC 56-0189 of the 29th TRS/363rd TRG, Shaw AFB, South Carolina

The unit, which traced its lineage back to the P-39F Airacobra-equipped 13th Observation Squadron (Medium) in 1942, operated RF-101Cs from 1957 to 1971, when it converted to the RF-4C. RF-101Cs began to reach the 363rd TRG in September 1957, and they had replaced RF-101As by May 1958. This aircraft was destroyed in an accident on 2 January 1969.

3
RF-101C-65-MC 56-0070 of the 32nd TRS/66th TRW, Phalsbourg-Bourscheid AB, France, May 1959

Although many 66th TRW pilots were eventually transferred to Southeast Asia-based squadrons involved in the Vietnam War, most of their aircraft went straight to ANG units when they were replaced in USAFE by the RF-4C. After more than a decade of service with the 66th TRW (latterly assigned to the 18th TRS), this aircraft was transferred to the 363rd TRW in 1969 and then served with the 165th TRS of the Kentucky ANG. Passed on to the Arkansas ANG's 145th TRS in 1975, the veteran jet was flown to Davis-Monthan AFB for storage in the MASDC in April 1976. It was salvaged in July 1984.

4
RF-101C-60-MC 56-0047 of the 15th TRS/67th TRW, Kadena AB, Okinawa, 1960

This Voodoo was one of the first to operate from Don Muang RTAFB when four aircraft deployed there for 48 hours on 6 June 1960 at the request of the Royal Thai government. This visit was followed by a four-aircraft deployment on 7 November 1961, which marked the start of the *Able Mable* task force operation. These elaborate squadron markings were removed when the 'Cotton Pickers' began *Able Mable* missions. 56-0047, later coded AH with the 45th TRS, was hit by Pathet Lao ground fire but survived the war. It later served with the 153rd TRS of the Mississippi ANG prior to being flown to the MASDC in April 1976 and salvaged in November 1984.

5
RF-101C-70-MC 56-0094 of the 45th TRS/39th AD, Misawa AB, Japan, 1960

Still bearing the kangaroo 'zaps' applied in Australia during the long-distance Exercise *Hand Clasp* deployment in 1959, this aircraft was also adorned with the nickname *BLUE STEEL WHISTLER* – a number of 'Polka Dots' RF-101Cs were personalised in this way at the time. 56-0094 was destroyed in an accident on 3 October 1964.

6
RF-101A-35-MC 56-0160 of the 363rd TRW, Shaw AFB, South Carolina, October 1962

This was one of the Voodoos made ready to participate in the reconnaissance missions necessitated by the Cuban Missile Crisis in October 1962. It has an overall Aircraft Gray anti-corrosion paint scheme and TAC markings on the tail. By 1968 it was still with the 363rd TRW, training RF-101C pilots with the 4414th CCTS. It was eventually transferred to the 191st TRG of the Michigan ANG, with whom it served until sent to the MASDC in May 1972. The jet was salvaged three years later.

7
RF-101C-65-MC 56-0085 of the 45th TRS/39th AD, Misawa AB, Japan, 1961

Bearing the nickname *Georgia Peach III* on its main undercarriage door (not visible in this profile artwork) and leaping-tiger art inspired by markings seen on Royal Thai Air Force F-86Ds, 56-0085 was also a participant in Exercise *Hand Clasp* to Australia. Transferred to the 20th TRS/432nd TRW at Udorn RTAFB, the aircraft was shot down by an SA-2 near Yen Bai on 21 June 1967. Capt R E Patterson attempted to out-manoeuvre the SAM but it exploded close to his jet, causing extensive damage. Patterson flew north and then ejected, soon being recovered by a helicopter. He was shot down for a second time three months later in RF-101C 56-0181, surviving once again.

8
RF-101C 56-0230 of the 15th TRS/67th TRW, Tan Son Nhut AB, South Vietnam, 21 November 1964

Capt Burt Waltz was performing a *Yankee Team* reconnaissance flight over Laos from Tan Son Nhut AB in this *Able Mable* RF-101C on 21 November 1964 when it was hit by 37 mm AAA. Waltz was rescued by a CIA-operated helicopter. It was the first RF-101C loss to ground fire, and a major retaliatory air strike was vetoed by the Johnson administration. 56-0230 was the penultimate RF-101C to roll off the McDonnell production line.

9
RF-101C-45-MC 56-0178 of the 38th TRS/66th TRW, Ramstein AB, West Germany, 1964

The Berlin Crisis during the summer and autumn of 1961 prompted the adoption of a nuclear bomber role by the 66th TRW's RF-101Cs until their redeployment to RAF Upper Heyford in September 1966. This aircraft, which also flew with the 20th TRS/363rd TRW, was reassigned to the 15th TRS and painted in anti-corrosion Aircraft Gray. On 5 October 1965 56-0178 was crash-landed at Da Nang AB after being hit by AAA near Kep. Capt Robert Pitts escaped uninjured from the fire-damaged aircraft, despite its undercarriage collapsing when he touched-down on the runway.

10
RF-101C-70-MC 56-0090 of the 38th TRS/66th TRW, Ramstein AB, West Germany, 1963

The 38th TRS (which also had a secondary nuclear bomber role) moved to Ramstein from Toul-Rosières in February 1962. This Voodoo was eventually transferred from USAFE to the 20th TRS/460th TRW at Tan Son Nhut AB. While detached to Udorn on 22 April 1966, it was hit by ground fire 50 miles from Hanoi and caught fire, becoming the seventh RF-101C to be lost that year. Maj Alan Brunstrom, on his 115th combat mission, ejected and became a PoW until 12 February 1973.

11
RF-101C-55-MC 56-0207 of the 45th TRS/39th AD, Tan Son Nhut AB, South Vietnam, 1964

Depicted here in overall Aircraft Gray finish, with a PACAF shield on the tail, 56-0207 was eventually transferred to the 20th TRS/432nd TRW at Udorn. The aircraft was subsequently shot down by an SA-2 on 1 August 1967 20 miles northwest of Hanoi, despite the Voodoo carrying a protective AN/ALQ-51 DECM pod that should have prevented the SAM from tracking the RF-101C. Capt Charles C Winston III did not eject from the aircraft prior to it crashing.

12
RF-101A-30-MC 54-1514 of the 363rd TRW, Shaw AFB, South Carolina, 1964

Several experimental camouflage schemes trialled in 1964 at Shaw led to an early version of a standardised scheme being adopted the following year – the first to be applied to a US tactical aircraft. Aside from 54-1514 depicted here, 54-1507, 54-1512, 54-1516, 54-1517 and RF-101C 56-0228 were among the other Voodoos that were painted in variations on this initial scheme. Most retained the large black USAF markings and full-sized insignia above the wings, although the fuselage insignia on this aircraft was slightly smaller than usual. 54-1514 took part in Exercise *Desert Strike* in May 1964 when based at Ontario Airport, California, and it was later lost in a fatal accident near Franklin, North Carolina, on 16 March 1966 while still assigned to the 363rd TRW.

13
RF-101C-60-MC 56-0223 of the 45th TRS/39th AD, *Able Mable* Alpha Task Force, Tan Son Nhut AB, South Vietnam, 1965

This late-production RF-101C, an early recipient of the standard TO-1-1-4 camouflage scheme, had previously flown with the 66th TRW in USAFE. The jet later completed its career with the 165th TRS of the Kentucky ANG before retirement to the MASDC in February 1976.

14
RF-101C-40-MC 56-0165 of the 15th TRS/18th TFW, Kadena AB, Okinawa, 1965

Transferred from the 363rd TRW to the 20th TRS/432nd TRW at Udorn, this aircraft was shot down by AAA close to Yen Bai air base in North Vietnam after suffering from instrument failure. The pilot, Capt Arthur Warren, ejected and remained in contact with USAF aircraft for two hours but was presumed killed in action thereafter. This Voodoo, as '*Sun-Run 3*', secured a transcontinental flight record for 1Lt 'Gus' Klatt (of the 18th TRS) on 27 November 1957.

15
RF-101C-55-MC 56-0220 of the 45th TRS/39th AD, Udorn RTAFB, Thailand, March 1966

This ex-66th TRW aircraft was probably shot down in the heavily defended Vinh area by an SA-2 on 7 March 1966, killing pilot Capt Gordon L Page. His wingman's aircraft, 56-0043, was also lost on the mission and its pilot, Capt Jerdy A Wright, also killed. There was some uncertainty as to whether both aircraft fell to SA-2s or had possibly suffered a mid-air collision while trying to avoid the missiles.

16
RF-101C-50-MC 56-0187 of the 363rd TRW, Shaw AFB, South Carolina, 1967

This aircraft (again an ex-66th TRW Voodoo) was used for ECM and RHAW trials at Eglin AFB in late 1967 as part of a programme to improve the type's survivability in an increasingly hostile ground-to-air defence environment. It was fitted with underwing pylons to test ECM pods, including the QRC-160 depicted here. Post-war, the RF-101C joined the 154th TRS of the Arkansas ANG in 1975 – it was painted in very basic camouflage and markings, together with formation strip-lights, during this period. In 1977 the jet was transferred to the 153rd TRS of the Mississippi ANG. Since its retirement, 56-0187 has been preserved at Cannon AFB, New Mexico, with the erroneous serial '43436'.

17
RF-101C-65-MC 56-0063 of the 20th TRS/432nd TRW, Udorn RTAFB, Thailand, 1967

Yet another former 66th TRW aircraft, this Voodoo served with the 18th TRW before reassignment to the 20th TRS. It was destroyed in a landing accident – attributed to pilot error – at Udorn on 12 March 1967. Serial numbers on RF-101s were presented in a variety of styles until the standard two-letter code and 'last three' serial digits were decided upon during 1968. From mid-1955, a prefix '0' was usually attached to serials of aircraft more than ten years old. This was not to advertise their longevity but to avoid apparent duplication of serial numbers on different airframes when it was decided to display incomplete fiscal year information on aircraft tails. The practice was phased out from 1972.

18
RF-101C-65-MC 56-0061 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, June 1968

This Voodoo is depicted with the squadron's AH tail codes that were introduced in mid-1968. It later flew with the Mississippi ANG's 153rd TRS before being retired to the MASDC in January 1979 and salvaged in September 1984. The 45th TRS later flew RF-4Cs from 1971 at Bergstrom AFB, Texas, with BB tail codes.

19
RF-101C-65-MC 56-0068 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

Nose-art was seen on a number of 45th TRS RF-101Cs in 1969-70, including 56-0068 which was christened *MITZIE KAY*. Udorn-based aircraft generally featured only standard markings, however. Originally a 363rd TRW jet, 56-0068 was preserved at Offutt AFB, Nebraska, before being displayed at Keesler AFB's Air Park in Mississippi.

20
RF-101C-55-MC 56-0219 of the 20th TRS/432nd TRW, Udorn RTAFB, Thailand, March 1967

Formerly with the 17th TRS/66th TRW in USAFE, this Voodoo was withdrawn from service after suffering undisclosed damage at Udorn in July 1968. It has the basic TO-1-1-4 camouflage and low-visibility markings applied by the 66th TRW and then retained following the jet's transfer to the 432nd TRW.

21
RF-101C-70-MC 56-0105 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, June 1970

Christened *THE IRON EYEBALL* (a nickname that appeared on the left side of the nose, originally in a fairly restrained format but later in bold white letters), this aircraft was assigned to Maj Paul Cusick in 1970. The 'Polka Dots' fin cap is a relic of the original full squadron scheme, versions of which appeared on the propeller spinners of 45th TRS RF-51 Mustangs during the Korean War and then on the tails of the squadron's RF-80 Shooting Stars from 1953 and RF-84F Thunderflashes from 1955. RF-101C 56-0217 was similarly decorated. Surviving the Vietnam War, 56-0105 was passed on to the Mississippi's ANG's 153rd TRS and finally salvaged at the unit's Key Field home in September 1977.

22
RF-101C-60-MC 56-0041 of the 45th TRS/460th TRW, Phu Cat AB, South Vietnam, 1969

Phu Cat was used as a forward operating airfield to reduce RF-101C mission times from Tan Son Nhut. Post-war, this aircraft was also transferred to the 153rd TRS of the Mississippi ANG, who eventually flew it to the MASDC in February 1976. The veteran jet was salvaged there in November 1984.

23
RF-101C-75-MC 56-0119 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

In April 1959 this aircraft had set new 1000-km and 500-km closed course world speed records (Mach 1.06 and Mach 1.24, respectively) while being flown by Capts Edward H Taylor and George Edwards during Project *View-Do*. Ten years later, and following service with the 66th TRW, 56-0119 was flying with the 45th TRS. Assigned to Maj John Summers, the aircraft featured a red dragon on its nose and, somewhat confusingly, the titling *THE GREEN DRAGON* immediately above the artwork. After Vietnam service it was transferred to the 153rd TRS at Key Field, Mississippi, and finally retired to the MASDC in March 1976. The aircraft is reportedly in storage within the Paul Garber Facility of the National Air and Space Museum in Silver Hill, Maryland.

24
RF-101C-45-MC 56-0176 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

Previously nicknamed *KATHY'S CLOWN*, with the same artwork on the nose, this aircraft had become *GERRY'S CLOWN* by 1969. Three small Purple Heart medals had been painted onto the fuselage immediately below the nose art, denoting that 56-0176 had been hit three times by ground fire while overflying the A Shau Valley on 4 January 1969. Yet another Voodoo passed on to the 153rd TRS, the aircraft was transferred to the MASDC in February 1978 and salvaged in September 1984.

25
RF-101C-40-MC 56-0166 of the 45th TRS/460th TRW, Tan Son Nhut AB, South Vietnam, 1969

Another aircraft to feature a nickname (*LUV BUG!*, complete with 'intertwined' footprints!), this jet had been transferred to the 45th TRS from the 363rd TFW as an attrition replacement in 1967. Ten years later it joined the 153rd TRS of the Mississippi ANG. On 27 October 1978, 56-0166 was flown directly from Key Field to the National Museum of the USAF at Wright-Patterson AFB, Ohio, having accrued 6604.9 flying hours. Prior to its Vietnam service, 56-0166, flying as '*Sun-Run* 3', had been the first of four RF-101Cs to embark upon the Los Angeles to New York record flights on 27 November 1957, with Capt Ray Schrecengost Jr at the controls.

26
RF-101C-70-MC 56-0053 of the 20th TRS/460th TRW, Udorn AB, South Vietnam, 1967

Southeast Asian operations were hard on paintwork, and although groundcrew generally kept the aircraft in good external condition, combat damage and weathering required frequent touch-up work with spray paint. This aircraft, originally with the 15th TRS, later returned to the 29th TRS/363rd TRW in 1970 following four years assigned to the 20th TRS at Udorn. Upon its return to the USA, the aircraft was passed on to the 165th TRS and finally sent to the MASDC in March 1976. It was salvaged in July 1984.

27
RF-101C-40-MC 56-0168 of the 45th TRS/460th TRW, Tan Son Nhut AB, 1969

This aircraft, nicknamed *LIL MISS SWEETNESS*, was involved in a mid-air collision with RF-101C 56-0217 on 30 April 1969, sustaining considerable damage to its right wing and engine nozzle, while '217 had most of its nose removed. After repairs, 56-0168 flew with the 153rd TRS until it was struck off charge in October 1974. This aircraft was also one of the *Sun-Run* record-breaking RF-101Cs in November 1957, being flown by Capt Robert Burkhart as '*Sun-Run 6*' with orange stripes around its fuselage.

28
RF-101A-35-MC 54-1519 ('5656') of the 4th CRS, Taoyuan AB, Taiwan, 1960

Initially serving with the 4411th Combat Crew Training Group of the 837th Air Division at Shaw AFB, this RF-101A was among the first four supplied to the RoCAF in late 1959 from PACAF squadrons at Kadena and Misawa ABs under Project *Boom Town*. It was shot down by a MiG-19 while flying a reconnaissance mission over the Taiwan Strait on 18 March 1965.

BELOW
As soon as a pilot had shut down his engines the flightline technicians opened up the camera bays to extract film magazines that would then be rushed off to the laboratory in a 'bread truck'. Tan Son Nhut RF-101Cs often shared revetments with RF-4Cs of the 12th or 16th TRSs, although this staged photograph was probably taken at Shaw AFB (*USAF*)

29
RF-101C-60-MC 56-0048 of the 31st TRTS/363rd TRW, Shaw AFB, South Carolina, August 1970

Shaw AFB was responsible for all RF-101 training, with pilots receiving tuition from instructors assigned to the 4414th CCTS (re-numbered the 31st TRTS in October 1969). It was also home to the 4416th Test Squadron (code JM) with RF-101s and RF-4Cs, as well as two operational units, the 29th (JO) and 18th (JP) TRSs. The latter two squadrons had swapped their RF-101s for RF-4Cs in 1970-71. 56-0048 was preserved at Selfridge Military Air Museum, Michigan, following its retirement.

30
RF-101C-65-MC 56-0080 of the 29th TRS/363rd TRW, Shaw AFB, South Carolina, 1967

This aircraft was equipped with an AN/ALQ-51 ECM test system as part of the effort to protect RF-101s from SAMs and radar-directed AAA prior to it being transferred to the 45th TRS/460th TRW later in 1967. In the case of 56-0080, the ECM equipment clearly worked, as the jet survived several years of combat in Vietnam prior to returning to the 363rd. Post-war, it was passed on to the 153rd TRS and eventually retired to the MASDC in January 1979. The jet was salvaged here in September 1984.

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Front Cover
The northwest railway line supplying North Vietnam from China was under almost constant surveillance and attack during the Vietnam War, and RF-101Cs had to perform most of the photo-reconnaissance required to monitor the incoming traffic. Maj Bobby Ray Bagley, regarded as one of the most skilled RF-101 pilots, was tasked with photographing a section of the rail route during a 16 September 1967 Route Pack VI mission. Flying RF-101C 56-0180 of the 20th TRS/432nd TRW from Udorn RTAFB, he completed his photo runs near Thanh Son and Nghia Lo before commencing his climb up to 24,000 ft for the return journey to Udorn. As this artwork reveals, he was opposed by AAA on his photographic passes.

Two MiG-21F-13s of the 921st Fighter Regiment at Noi Bai air base were scrambled to intercept him at 1055 hrs. Vietnamese Peoples' Air Force pilots Nguyen Ngoc Do and Pham Thanh Ngan accelerated to Mach 1.4 and climbed to intercept the RF-101C, cruising some 4000 ft above them, over Son La. Ngan fired an R-3S air-to-air missile that severely damaged Bagley's aircraft when it hit the Voodoo. Maj Bagley, who had asked to extend his Southeast Asia tour so that he could fly the RF-101C, ejected and landed in hills 60 miles southwest of Yen Bai, where he was captured and subjected to repeated brutal treatment during his incarceration. He was released from prison in Hanoi in 1973 and returned to his career at Shaw AFB, retiring as a Colonel.

Several hours later, squadronmate Capt Bob Patterson was tasked with a repeat photo run over the same railway target to take the required images, but his aircraft (56-0181) was hit by AAA and he had to eject near Ban Ban, in northern Laos, 150 miles from Udorn – he was rescued by a USAF helicopter shortly thereafter. Although Patterson stated that his aircraft was hit by ground fire, MiG-21F-13 pilot Nguyen Ngoc Do claimed that he shot the Voodoo down with an R-3S missile, giving him ace status. A total of three USAF reconnaissance aircraft were lost on 16 September as, aside from the two RF-101Cs that were destroyed, 16th TRS/460th TRW RF-4C Phantom II 64-1037 from Tan Son Nhut AB failed to return from a night mission over southern North Vietnam. Both crew remain listed as Missing in Action (*Cover artwork by Gareth Hector*)

Title Page
RF-101C-55-MC 56-0203 makes a safe recovery along Tan Son Nhut's heavily protected runway. It was lost on 8 February 1967 during a coastal reconnaissance mission over North Vietnam when it was hit by barrage AAA near Dong Hoi. Capt J H Rogers ejected from the blazing Voodoo and was recovered by a US Navy vessel (*Terry Panopalis Collection*)